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Precision Measuring Instruments

Used by the German Machinery Industry

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GERMANY is following new and seemingly successful methods to regain her former position in the international machinery market. To this end, she has turned back to her pre-war principle, abandoned in the early post-war years because of American competition, and is again stressing durability and precision in her designs. But, following the example set by American manufacturers, prices had to be lowered somewhat, and the manufacture of single units had to be abandoned in favor of quantity production.

The two main expedients used were:

1. Systematic establishment of standards by DIN (German Industrial Standardization Committee).
2. Enlistment of the optical industry, for the dual purpose of cheapening and simplifying measuring methods.

The first-named measure has already brought results,

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Wise manufacturers watch competitive products and practices. Mr. Van Steewen shows how standardization and, particularly, the means of maintaining the standards, are enabling Germany to re-establish herself as an important competitor in the machinery markets of the world

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and it is worthy of note that at the recent meeting of the International Federation of the National Standardizing Associations (I.S.A.) at Copenhagen, Denmark, a probational introduction of German standards established during the last few years and applicable to various branches of the machinery industry, was recommended by the 80 representatives of 16 countries as a means of developing internationally uniform production and drawing standards.

The second measure consisted of refining inspection methods to permit less variation on account of the personal equation and of closer tolerances. To do this it was necessary both to design new types and to devise methods for adapting inexpensive measuring instruments and devices to practically every operation in metal manufacturing. Some of the instruments shown are not new, but the adaptation in most cases is recent, and, as stated, is intended as a part of a definite scheme to rehabilitate German metal-working industries.

Ordinary snap gages, of adjustable models, have been redesigned. Several firms offer external gages that may be adjusted for different diameters, wear of the measuring surfaces being compensated for by readjustment. External gages equipped with dial indicators intended for the measurement of large-diameter shafts are being offered. It is a known fact that in most cases the use of ordinary gages is accompanied by inaccuracies chargeable to the varying pressure exerted during measurements. For the measurement of heavy round parts difficult to handle, saddle-gages are frequently used, the best-known models being those of Krupp, and Fortuna. These devices will be described in detail later on.

The Hirth Minimeter and its various modifications are applicable to all kinds of measurements. As is well known this gage must be set by a precision gage block, an accurate plug gage or a standard piece. It then shows at a glance how much the tested piece differs from the standard size.

Fig. 3 shows the construction principle of the Minimeter. The measuring pin *A* carries an intermediate piece having at its lower end a pointed part *B* and at its upper end a knife edge *C*. This edge carries a prismatic piece *D* connected with a second prismatic piece *E* which has its support on the fixed knife edge *H*. The fulcrums of *C* and *H* are arranged at the same

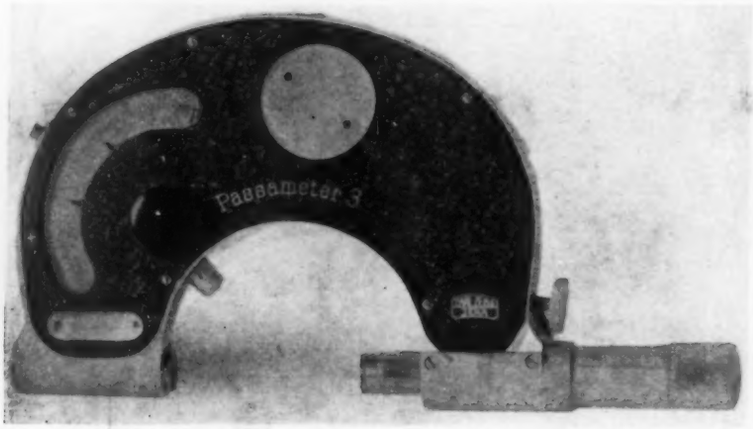
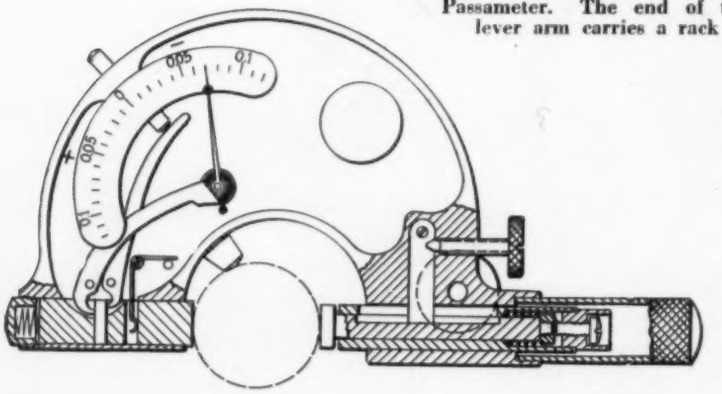


Fig. 1—Passameter, that combines the construction of micrometer and dial gage

Fig. 2—Lever movement of the Passameter. The end of the lever arm carries a rack



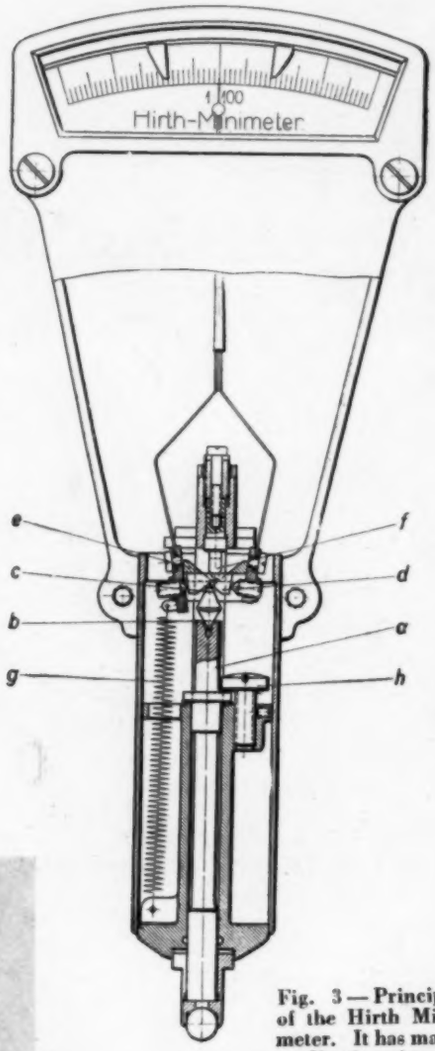


Fig. 3 — Principle of the Hirth Minimeter. It has many applications in precision gaging

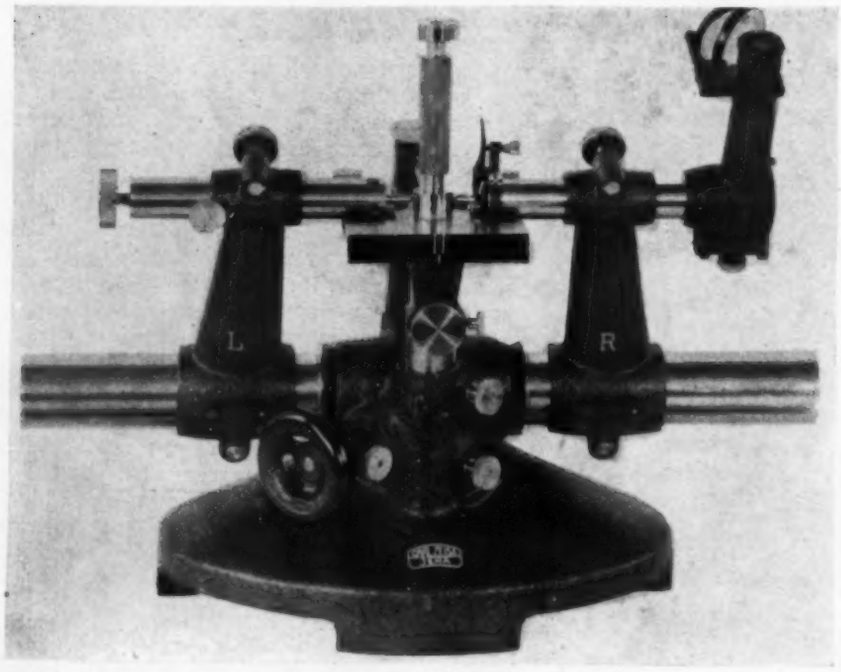


Fig. 5—Application of the Optimeter to external gaging

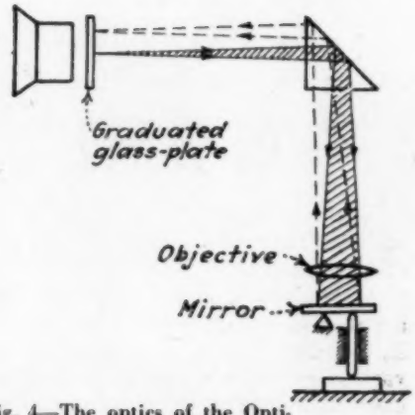


Fig. 4—The optics of the Optimeter. A double reflection is projected from the same prism

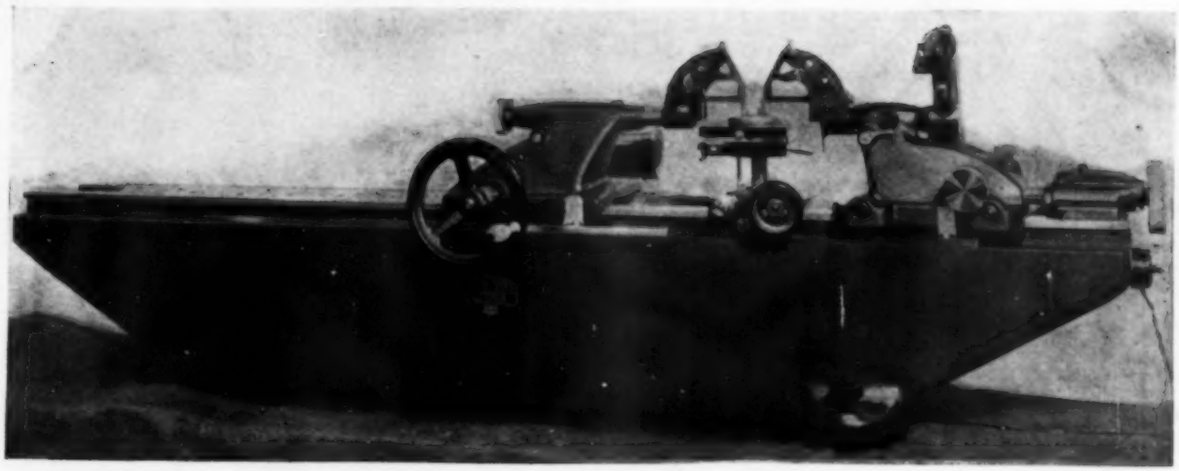


Fig. 6—Optimeter with auxiliary fixtures for internal gaging

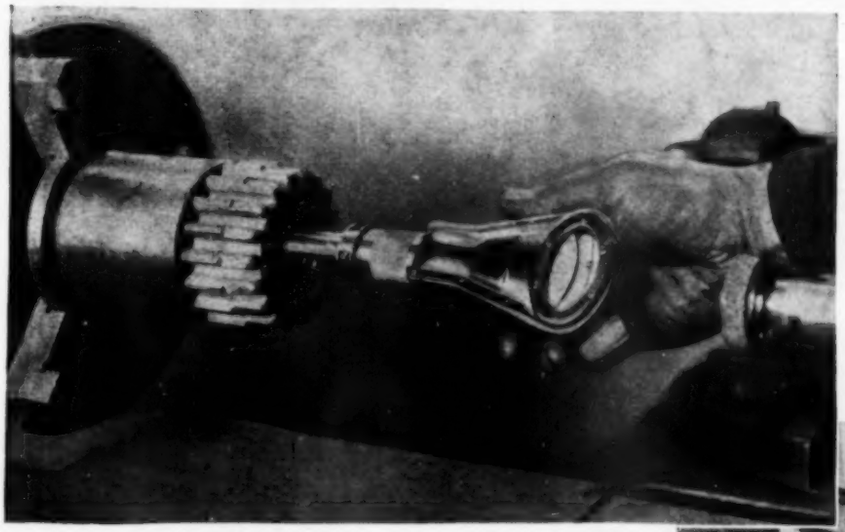
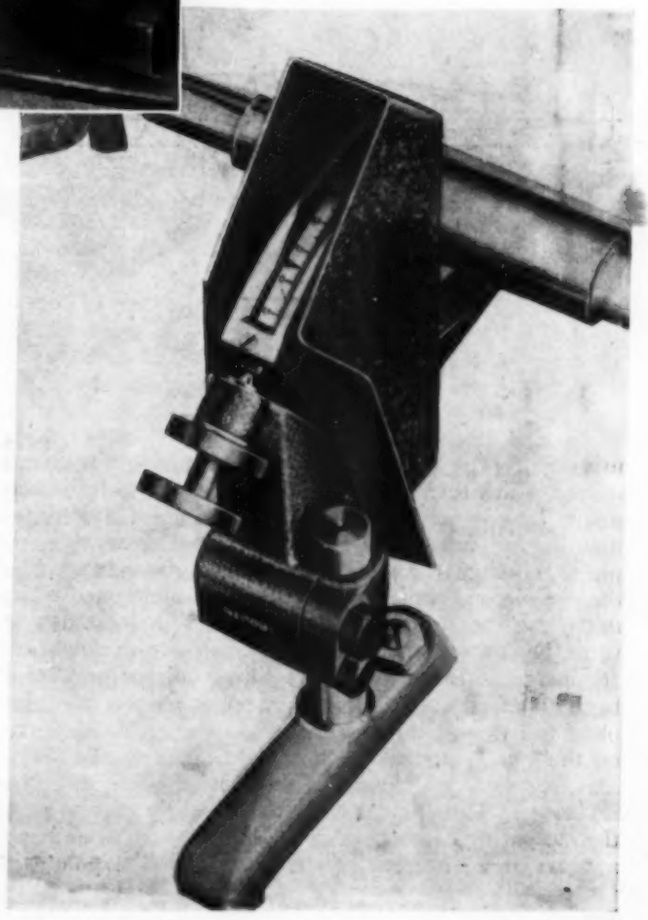


Fig. 7—One of the various Microtast applications. Gaging a blind hole

Fig. 8—Single point automatic external measuring instrument



height, but not in the same vertical plane. By pressing upon measuring pin *A*, the prismatic piece is rocked on the knife edge *H*, and by this means the pointer fixed to the prismatic piece *E* is moved across the scale. The spring *G* brings the pointer back to its original position. The screw *J* serves to avoid damage by excessive pressure.

An instrument for checking the thickness of mass products is the so-called "Optotest," made by Zeiss and illustrated in Fig. 3. The instrument works on a combined optical and mechanical basis. Any variation of the objects under inspection is multiplied by a lever which turns a mirror, the latter reflects the image of an illuminated index onto a fixed scale where readings corresponding to the deformation are taken. The instrument may of course be adapted to other purposes, as for instance checking the accuracy of ball-bearing rings, etc.

A widely used instrument, the Zeiss Optimeter, Fig. 4, may, in its different forms and applications, be considered as being almost universal. Some of its applications are already familiar in the United States.

With this instrument we avoid many of the inaccuracies inherent in micrometers, mechanical indicators, etc. The measuring pin, upon which the contacting caps are mounted, may be moved in the direction of its axis by means of an adjustable lifting lever, stops being provided for this movement. The upper end of the meas-

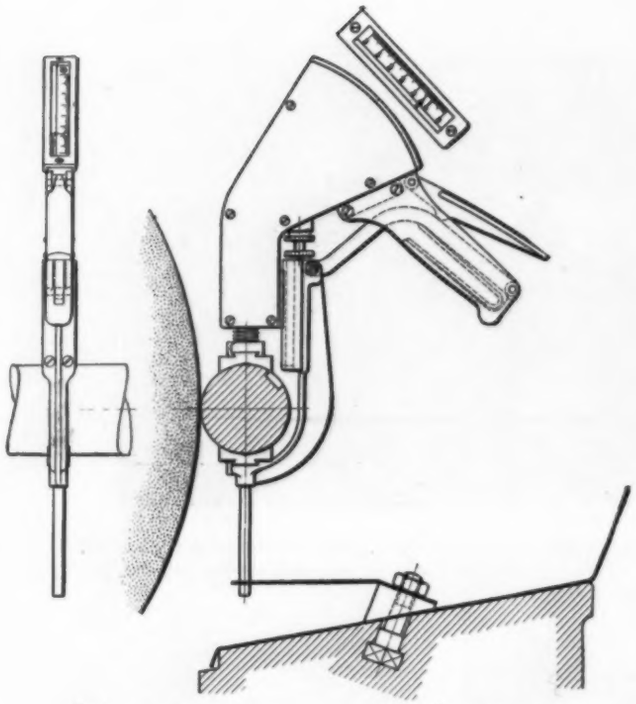


Fig. 9—Automatic external measuring device for spline shafts

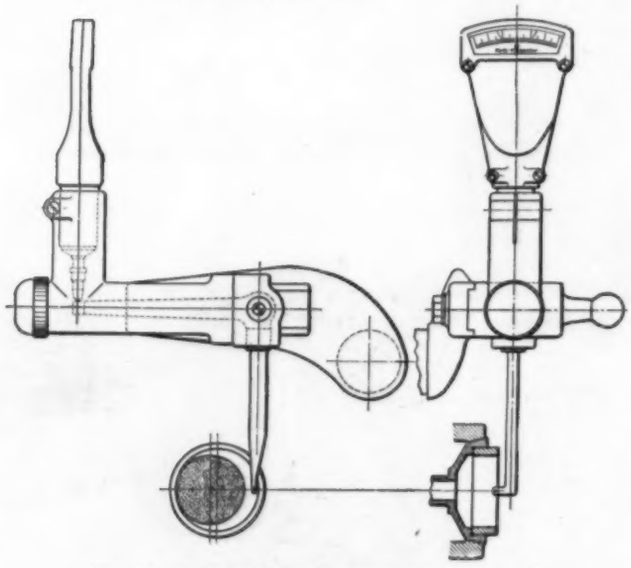


Fig. 10—Internal continuous contact type of gaging device

uring pin is spherically shaped and presses against a mirror which turns on its knife-edge support and is kept under tension by a spring. By the aid of the hinged illuminating mirror externally mounted near the eye-piece, an image of a scale etched on the glass plate behind the eye-piece is projected onto the first-mentioned tilting mirror. The scale behind the mirror is located sideways, however, thus remaining invisible to the observer. Its image is reflected by the tilting mirror and, after having passed the objective, is portrayed on the glass plate and viewed through the eye-piece. A fixed mirror on the glass plate, being at a right angle to the optical axis, serves as a pointer for the moving scale, or rather its image. Thus, if the mirror is tilted by movement of the measuring contact pin, a deflection of the scale image appears at a different height relative to the pointer.

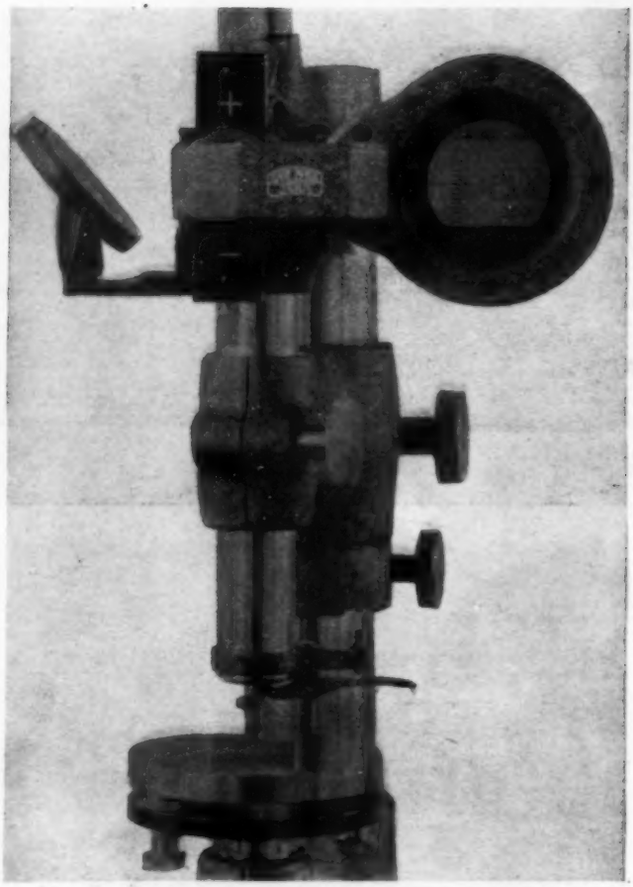


Fig. 11—Zeiss Optimeter with projection device intended to relieve eye strain

Another form of the Optimeter has a horizontal stand. This model is a simple and inexpensive measuring machine for shop use and is especially suited for testing the diameters of plug gages, which, due to the length and weight of their handles, are not readily measurable in a horizontal position. The measurement is accomplished by comparison with Swedish gages. Fig. 5 shows the measurement of a limit plug gage between centers. In Fig. 6 a large Zeiss measuring machine is to be seen equipped with an internal measuring attachment using the Optimeter.

A Krupp Mikrotast internal gage for checking the seat of a ball-bearing (blind hole) during the grinding operation is shown in Fig. 7. The adaptor carries an interchangeable square plate, with one measuring point and three points of abutment formed by its three-crowned corners. Different plates must be substituted for different diameters.

Fig. 8 shows an automatic single-point external measuring instrument fixed to the table of the grinding machine by means of a special support. The strong contacting lever, equipped with a diamond point, is suspended by a flat spring, since a journal bearing is subject to wear caused by abrasive dust. By means of the contacting lever, the deviations of the work are directly transferred onto the Minimeter, which indicates deviations of the radius, rather than the diameter, thus enabling the workman to read off the measure for readjustment of the grinding wheel. The instrument can be used for diameters ranging from 5 to 110 m.m. or approximately $\frac{3}{16}$ to $4\frac{5}{16}$ in. The smallest reading obtainable is 0.003 m.m. or 0.00011 in.

A modified form of this instrument, Fig. 9, is built for testing objects with keyways or longitudinal slots. It is provided with measuring jaws which fit accurately the external diameter to be measured. These jaws slide on the work. The lower jaw is connected to the fixed bracket and the upper one directly to the Minimeter. In this case, deviations of diameter are indicated accurately to 0.005 m.m. or 0.00019 in. The wear of the measuring jaws is compensated for by readjustment.

The automatic internal measuring instrument shown at Fig. 10 can be used for bores of 20 to 200 millimeters diameter, i.e. $\frac{13}{16}$ to $7\frac{7}{8}$ in. A swiveling bracket in the shape of an equal arm bell crank is fitted with a diamond contact point which continuously presses against the internal surface of the bore.

As shown in Fig. 11, the Optimeter is also supplied with a projection device, in order to avoid eye fatigue of the observer. With this projection device and an additional mirror the image of the scale is shown on a focussing screen inside a blackened tube. By this means also, the indistinct appearance of the scale image in broad daylight or in brightly illuminated rooms is avoided. The scale image moves on the focussing screen in the same manner as inside the eye-piece, only here it appears larger.

The first installment of a series. To be continued next week.

Some Day

DONALD RAEBURN
Glasgow, Scotland

TURNING over the pages of an *American Machinist* dated 1914, I found on page 448 an article on "Industrial Management" by E. H. Fish. In a paragraph headed "The Simple Elements of Machine Work" the author writes, "Some day someone is going to give us a monumental work on the simple elements of machine work by which we will be able to find out what is the best combination of speed, depth of cut and rate of feed, at which to turn a 9-in. by 3-in. pulley which has five arms of a given cross section and can be mounted on a mandrel of a given size. It will also tell us what speeds and feeds to use if it is to be chucked by the arms and turned and bored at one setting. These things are too simple to attract people's attention today but they are essentials. They are what make up the great total of machine-shop processes. They are the things on which shops are declaring dividends or passing them."

Is the above not as applicable today? In the last sixteen years the machine-tool builders have supplied an immense number of machines all equipped to increase production. Tool-steel makers have supplied us with many brands of improved high-speed steels, but apart from an increasing rigidity in machine tools, the position as affecting general engineering seems to remain the same. A light shaft 5 ft. 4 in. long is to be machined to $1\frac{1}{4}$-in. diam. on one end 30 in. long and threaded $1\frac{1}{4}$ in., Whitworth gage on the other end 30 in. long. Will we machine the work in the hollow spindle lathe or on the turret? If we use the lathe must we use the traveling steady rest, or if we do not use the steady rest, what feed must be used and how do we arrive at our decision? A shaft 30 ft. long, largest diam. 5 in., must be machined all over. The design of shaft prevents the use of the traveling steady rest. The shaft must be round, true and finished all over. How will we proceed? We can slip two catheads on the shaft, rough-turn and then drop the shaft to discover how far it has sprung. Provided the shaft has been annealed, we have sufficient material and can again adjust the catheads true, using the four screws provided for that purpose. But where will we place the catheads, supported by stationary steadyrests, to obtain sufficient rigidity and insure a satisfacory job? If we arrange the steadies to support the shaft in lengths of ten feet, we have not solved the problem of the spring in the shaft while machining.

Next, what is the best feed to use to overcome the lack of rigidity? We can use more than two steadies, but this adds to our troubles in aligning the shaft to insure the machining of work parallel. Machine-tool builders do not provide steadyrests that are self-aligning, and the solution of this problem is left to the ingenuity of the shop executive. With reference to the use of steadyrests to support work, have we any formula to guide us, outside of our experience? If we devise a formula, will it satisfy if applied in all cases, or will it be rendered useless by a further study of feed and speed and of the material being machined? If we accept a formula, would a length sixteen times the diameter be excessive, and to what diameters would we require to confine the formula? There are still some pulleys to be turned and bored, about 30 in. in diameter, $3\frac{1}{2}$-in. bore and 14-in. face. If gripped in the chuck by the hub, there are certain precautions that must be taken to insure the truth of pulley on face and edge. Given these precautions as understood and always taken, what feed will we start with and to what can we increase the feed and guarantee a satisfactory job, always remembering the relation of the diameter of the hub held in the chuck to the diameter and width of face being machined? Our small lathe faceplates are provided with two slots opposed to each other. Larger faceplates are equipped with many slots so that the drivers can be adjusted to drive correctly, but how often do we find more than one driver being used? Some executives do not object, believing, and correctly so, that one straight pin driver is superior to the bent tail catch in eliminating spring. In the heavier classes of engineering work some executives desire that, in the finish machining of the parts, the driving should be carried out by gripping the work in the chuck jaws and supporting it by the tailstock center. Elsewhere we find the work being revolved between the lathe centers, two drivers properly adjusted being used, and if we examine the pages of the *American Machinist* we will find the last-mentioned method of driving illustrated. Why the difference in methods? And has anyone given us any data re a comparison of the results obtained in the course of erection of completed work?

It seems a pity that the main function of both time study and motion study should be for rate setting. In the hands of a mechanical analyst, both these studies would serve the purpose of standardizing the motions used in any machine operation.

The Foreman's Round Table

Carelessness

"LIFE is just one darn rule after another," quoth Ed. "Before I leave home in the morning my wife lays down a lot of rules. On my way to work I've got to observe traffic rules. When I get to work I meet up with Williams' rules, and when I go to lodge at night, more rules."

"Why the eruption at this particular time, Vesuvius? Did you and the lady who tolerates you disagree on something this morning?"

"No, we didn't disagree, but I wasn't feeling so good this morning, so I thought I would use the time it generally takes me to shave, in sleep. The wife noticed it at breakfast and gave me the usual line. It kinda peeved me."

"Oho, out with the queens last night!"

"Yup, I was out, but not with the queens, only eight and nine spots. I lost about six dollars."

"Is that what makes you so cranky?"

"No, I was mad at my wife for scolding; I was mad at myself for giving in and shaving after all. I cussed all the way to work because I was late, and the first thing I picked up on my desk was a new rule by Williams. Wouldn't that make any man rabid?"

"The way your wife bosses you around, Ed, is one of the best examples I ever saw of the power of mind over matter."

"Is that so?"

"You mentioned something about a rule, I haven't seen any. What is it about?"

"I think I've got it in my pocket. Yep, here it is—wait until I read it to you.

"'Subject: Carelessness. (1) We are agreed that there is no more effective remedy for careless work than laying off the one responsible for it. The influence of such a policy is felt by others than those laid off. (2) We are also agreed upon the following penalties: Warning for the first offense; three days layoff for the second; one week or more for the third. After that the penalty will depend upon circumstances. (3) This applies, of course, to work spoiled by carelessness whether intentional or unintentional. It is not an ironclad rule. There may be cases where the man should be discharged immediately. There may be other cases where he should not be laid off at all. Each case should be analyzed and handled without favoritism. Signed, G. B. Williams, General Superintendent. Effective this date.' Amen."

"Well, what about it, old rain-in-the face? Any objections?"

"Yes, several. In the first place a man can't help an accident. Second, you can't lay off one of your best men, and third that last paragraph reads like Williams had left a loop hole for himself if a foreman gets into a jam. He says that his rule is not ironclad. If a man squeals to him he can say that he did not intend it to apply in that particular man's case, can't he?"

"Wait a minute, let's take each one of your objections in turn. Number one, there is no such thing as an accident. Every one that happens is due to someone's carelessness."

"Yeah? I suppose that crane accident down at the big shop was carelessness?"

"I heard about it. I don't know just what happened, except that the load dropped. In the first place, would you want to say that the man was not careless in walking under a crane with such a heavy load? As I say, I don't know what let go, but if it was a rope sling I would say that the riggers used a frayed one, or did not pad the sharp corners. If it was a chain sling, either it had a kink in it, or the foreman had not had it annealed. If it was a cable, the maintenance man who inspected it was careless. On cranes, the safety factor is usually 10. Everything is ten times as strong as it need be. So it can't be blamed on weakness. The only man who had no responsibility for the accident was the operator.

"About your second objection. Would a good man object to being warned (I don't say called down) and, if he continues to have accidents, is he a good man? I leave it to you, Ed."

How about it? Is a man who has repeated accidents a good workman or a good executive? How would you define the difference between carelessness and an error of judgment? If a bonus for good work is equitable, is not a penalty for bad work equally equitable?

Discussion of Former Topics

On the Spot

It is much more feasible for a foreman who believes an office clerk or other subordinate is taking up too much of his time, to tell the offender diplomatically, and if it doesn't work, to go with equal frankness to the office man's superior. This will serve a twofold purpose; it will make the complaint specific, and it will cause the foreman to reflect first as to whether he himself, isn't unconsciously inviting or encouraging the contact.

I have in mind an occasion when I registered a complaint to a superior about two specific men in another division who required too much "cooperation" and personal service from the men in my division. I made the complaint specific, but the superior chose to issue a "diplomatic" general notice. As a consequence, all the men in the other divisions whose relationship to mine was right and proper came to me with a request as to how they might better comply with the notice, and expressed readiness to apologize if they had been wrong. The two men at whom the notice was aimed, never realized that it might refer to them. They shed it like water off a duck's back and went blithely on with their old habits. So, I'm for more of direct specific action and less of diplomatic general literature.

—Charles Klyne, *Foreman, Russell Machine Company.*

Slowing Down

In a census taken at a recent meeting of some of the heads of time study departments in various industries in this section the answer to the question of whether the men were slowing down was, in all but one case, yes. Piece work or any bonus system is, in my opinion, only an artificial boost in day rates, given to urge the men to do a full day's work, but I wish to qualify this statement by saying that I believe it not only to be a necessity, but a very valuable tool in the hands of able management. As for the men slowing down, I believe it to be the natural outcome of times of this sort, when the men know that there is only a certain amount of work to be done and that when it is done, they must loaf, reverting to the age-old theory of self-preservation. Some will argue that they are better off finishing the jobs at hand and earning the bonus attached thereto; but today we are dealing with a class of labor that is better informed and better educated than their predecessors were, and it is of no avail to tell that "fairy story," for the men themselves know that they get more work, therefore more money in the long run, during times of this sort by simply going at a pace that will insure their earning day rates only.

—C. R. Whitehouse, *Standard Engineer, Holtzer-Cabot Electric Company.*

Advice, Gratis

We all learn from those around us, whether it be the office boy, porter or the manager. We who are in executive positions can look back and recall those who gave us a helping hand. How did they do it? In the first place, they had our confidence. Confidence built up by many small tactful deeds and helpful hints as we were learning the ropes.

I am trying to get several boys to go to night school this winter. The method used is simple. At times these lads will come into the factory office while some blueprint is being figured out, or a job being estimated.

Curiosity is shown in every instance, especially if they have to wait while some part is being finished. I ask them if they know what is being done and then follow that up by showing them in simple language and figures just what we are trying to do.

Each one of these boys has stated that he wishes he could overcome his handicap in education and then night school is mentioned. At present, I have the promise of every one of them to go. One of the boys is studying now and he is coming to me after working hours for help in mathematics. —E. F. Werner.

Signing Off

It will make very little difference in the net results whether pen and ink or colored pencils are used by foremen to sign requisitions and so forth. It will only make more aggravating a task that is now generally disliked.

The idea that more thought will be given to the signature and what it approves, because it is inconvenient, will not help matters. As a matter of fact it is the reverse of the modern trend of having foremen do no pencil work at all.

On inside correspondence it makes no difference whether initials or the full name is used. Initials must, of course, be distinctive enough to be readily recognized as genuine.

L. F. Swenson.

Service or Ability

Ability should be the main factor in selecting a foreman or executive. I do not think it is wise to bring in an outside man if there is one as good working for the company. The one already employed by the company will be half again as valuable for the first year, due to his familiarity with equipment, material manufactured and the policies of the company. Taking a man from the ranks and promoting him keeps the rest of the workmen on their toes. They know that the policy of the company is to promote its own men.

—Norman Lapp.

The Deadline

Preferential treatment regarding vacations often arouses more resentment than differences in salaries. Standardization should be the aim. Classification of foremen and salaried workers into various grades in order to fix the length of their holidays sets up a problem which is incapable of solution in a manner agreeable to everyone. Those just on the wrong side of the deadline will feel sore and will not be easily placated.

It is an accepted custom that salaried workers who are not paid for extra work and overtime should be paid for holidays. In places where there is little or no overtime these classes of workers are the gainers, but in others they may be heavy losers. Any alteration in existing systems should be made with the idea of levelling up, not of cutting down, for a vacation without pay is not a vacation at all in the strict sense of the word.

—Roy V. Wade,
Glasgow, Scotland.

Service De Luxe

At the factory in which I am employed the men in most production departments work straight piece work and when the practice of opening the tool crib five minutes before the starting whistle and closing it five minutes after quitting whistle was put into effect, the management had in mind to make it possible for the more ambitious ones to operate their machines from the time of starting to stopping whistles.

We find after one and one half years of this practice that a goodly percentage of the men will come to the tool crib and get their tools and be ready to start their machines when the whistle blows, but only a small percentage will wait till after the quitting whistle to return their tools to the crib. It seems that nearly all are anxious to get started for home after the day's work, whether it be eight hours or nine.

We believe that it was a wise move and have no thought of discontinuing the practice. It has been profitable both for the men and the company. In fact, I believe if we tried to, there would be quite a loud complaint. But, of course, only from those who work piecework.

—Roger English, *Tool Supervisor, Relay Motors Corporation.*

Advice, Gratis

Any advice that conflicts with one's own desires naturally would pass through one ear and out the other.

Tell a gathering of shop men that twice the sine of half the angle equals the chord and they will think that you are a wise guy, but give them a problem where they will have to find the chord for themselves and they will come and ask for advice.

I had charge of a small tool room at one time where a sine bar was unknown. To gather the six men together and explain its working would have embarrassed them, and I might have heard some unpleasant things. I gave a jig to two men to build and informed them that the angle had to be within 5 sec., I left them alone.

They got their protractors out, but could find no seconds. Finally the two men came and asked how to get the angle that close, so I set a sine bar and showed them how easy it was, and before the day was over they all knew how.

No intelligent person likes to be approached with advice, however valuable or timely. It places them in the position of being deficient in judgment.

It is, however, easy to give advice if the giver will create a desire.

—W. E. Fischer, *Foreman, Bonney Forge & Tool Company.*

Service or Ability

The stand Ed takes should be applied in principle when hiring outside men. The employer should be interested in the prospective new executive's history only to ascertain that he has a good business background, training and broad experience; has produced results; is morally clean; and will fit in with the company's plans.

Doddering, stand-pat, "experience in our industry, on our industry's particular problems" ideas when employing a new executive have accelerated dry-rot in more companies than any other one cause.

The continuous employment idea has been a major factor in lowering the average of ability in the shop. When the management makes the mistake of letting an employee believe that each year of employment strengthens his hold on a job and gives him special unauthorized privileges, it is to be expected that the man will let down to a great extent. New blood that brings ability and a keenly trained mind is worth a shop full of "years of service" men. The new bloods may make some mistakes at first, but they seldom fail to profit thereby. The new methods of attack on the plant problems are a revelation to the "years of service" men and generally step up the efforts of the older hands.—E. E. Gagnon,
Mechanical Supt., U. S. Asbestos Division.

The Deadline

Williams would do well to do away with all holidays. There should be no employee who deserves a vacation, or yet has title to such a privilege. Many men spend the latter part of their vacation dreading their return to work, and finally return, to commence looking forward to the next vacation.

In view of the fact that I have accepted no two weeks' holiday in the past twelve years, and that the only illness I have suffered in that period was subsequent to one of my holidays, I cannot connect my state of good health to the latter.

The man who is not paid for overtime should recognize that this work is compensated for in his rate of pay and not by his annual vacation. An employee should consider himself just as much an interested member of the firm as its president, because both are to some extent dependent upon the organization for their existence. Such an employee will not spend two weeks per annum loafing at his boss' expense.

—D. O. Dunstone,
Durham, England.

Signing Off

In most plants the purchase department gets all requisitions for the purchase of materials and is usually familiar with supplies needed, also with the foremen's methods of writing and signing requisitions.

I do not see why the writing of requisitions should become a routine job. If a foreman must fill out all the blanks on requisitions, stating whether the material is for new work, repairs, or stock; when required, and usually a note at the bottom stating some particular characteristic of the material, he cannot do all this without realizing what he is doing.

A foreman with authority to write quit slips and time allowances, or interview an applicant for his department, cannot efficiently handle over fifteen men. In handling these men he becomes well acquainted with each one. In writing these slips I cannot see how he would not know the why and wherefore of each one and sign his initials or name as he sees fit. The tendency to give a foreman resposibility and then describe in detail just how he should exercise that authority is all too prevalent.

—J. Conrad Watson,
Master Mechanic, Franklin Pottery.

Industry's Responsibility in this Depression

The Swope plan, causes of this and other depressions, certain fundamental laws governing prices and prosperity, and steps which can be taken toward better times—Mr. Flanders covers them all and relates them into a program

RALPH E. FLANDERS
Manager, Jones & Lamson Machine Co.

AT THIS annual meeting of the National Machine Tool Builders' Association we will very properly concern ourselves with one of the most significant documents in industrial history—Gerard Swope's plan for stabilizing business and employment.

That document is significant in many ways. It comes from the executive head of one of the largest and most successful business organizations in the world. It expresses sentiments of social responsibility and practical acceptance thereof which would have been incredible a generation ago, or even a decade ago, but which now meet with an assent which is hearty and widespread. Finally, the proposal contains an offer of voluntary submission to a measure of governmental control. It is true that new power and privileges are asked in exchange, but that power is pledged to the maintenance of industrial stability, and the request for it does not destroy the significance of the attending offer.

A careful reading of the plan emphasizes the dual nature of his proposals. One relates to safeguarding the subsistence of the wage earner and his dependents in the event of accident, sickness, unemployment, old age and death. The other bears on the economic problem of general business stabilization. I would suggest that in considering his address we not only discuss in detail the employer-employee proposals, but that we analyze the question of industrial control on a somewhat broader basis, perhaps along lines which I am about to indicate.

In Mr. Swope's suggestions for the control of production and in many other similar treatments of this question there is present, tacitly or expressed, the assumption that industry itself is primarily responsible for the fluctuations of the business cycle and can, therefore, itself apply to them effective control. That assumption, in its direct and unqualified form, we must resolutely deny.

Plenty of Theories

There are innumerable theories as to the cause of this depression. To name but a few, it has been credited to over production by industry, reckless spending by wage earners, installment buying, technological unemployment, stock market speculation, inefficient distribution and many other causes. Some of these are more or less convincing explanations of certain elements of the cycle, but none of them holds good for any large percentage of the total experienced phenomena.

There is, however, one explanation to be found which does appear to offer enough of the needed corroboration to warrant its being taken seriously. The ideas involved are comparatively simple and can be set forth in a very few minutes to anyone familiar with general business procedure.

In its complete form it cannot be credited to any one man. The idea starts with the orthodox economic theory that production automatically generates the consuming power required to absorb the goods produced. This may be explained as follows:

Suppose that a firm is steadily producing and selling one hundred thousand dollars worth of useful products per month. Suppose further that neither the company, its employees, its sources of supply, its customers, or the world at large is saving anything—or losing anything for that matter. Let it be considered that every individual and group is spending money exactly as fast as it is received. Under these purely theoretical conditions the hundred thousand dollars which the firm receives for its January's output will be completely expended in February for materials, wages, salaries, dividends, depreciation and replacement, taxes, insurance, and other services.

Since all the individuals and firms to which this sum is paid are likewise spending all they receive, the entire amount of the sales is added to the general purchasing power of the community, and this amount each month is just what is required to purchase that month's output. The fact that the money paid by the firm does not go into the hands of the identical individuals who purchase its goods, makes no difference at all. Its expenditures, with those of all other producers, go into the general fund of purchasing power, and are exactly enough to purchase what all manufacturers together have made. Under these theoretical conditions production does generate its own purchasing power.

But these conditions never obtain, except as averages, occasionally and momentarily. Nor ought they to obtain. Under any conditions possible in the immediate future it is the duty of the individual and of the organization to lay by a reasonable amount in savings; and this necessary act at once, and for a time at least, withdraws money

Address delivered before the National Machine Tool Builders' Association at its autumn meeting, Chicago, Ill.

from purchasing power, and so contracts the market for our manufactured products. Hence, underconsumption or overproduction, whichever you wish to call it; and hence, the "paradox of thrift"—that saving may be individually necessary but socially harmful. This is the theory which has been so well developed by Messrs. Foster and Catchings.

The remedy proposed by these authors is the generation of new money by banking and governmental auspices to replace that withdrawn in savings. The remedial action may be effected by a change of the rediscount rate, or by open market operations of the Federal Reserve Bank, or by bond issues for public works by local, state and national governments. All of these actions effect an actual increase in our supply of money and credit in ways which it is not possible to describe here. This recognizes, as the classical theory does not, the actual elasticity of our medium of exchange. The public works proposal also would furnish wages directly to the unemployed.

Another authority—The English economist, J. M. Keynes—has carried the analysis to a further refinement. It may be put in two statements. The first and simplest is that investment should equal savings. This may be elaborated into a second, that when the rate of investment exceeds the rate of saving, we have prosperity and rising prices; and when the rate of saving exceeds the rate of investment we have business recession and falling prices.

The first statement is clear on the face of it, in view of our analysis of the Foster and Catchings presentation, and goes far to resolve the paradox. For it is clear that savings are not ordinarily put in the stocking or under the mattress, but are deposited in banks or with insurance companies; and from such repositaries they ordinarily find their way by various routes to the investment market. By "investment" in the sense we are using the term, is meant new investment—not the purchase of old securities which someone else has sold, but the actual issue and sale of new securities for new development, or some other type of actual expenditure for increased capital goods, like buying machine tools.

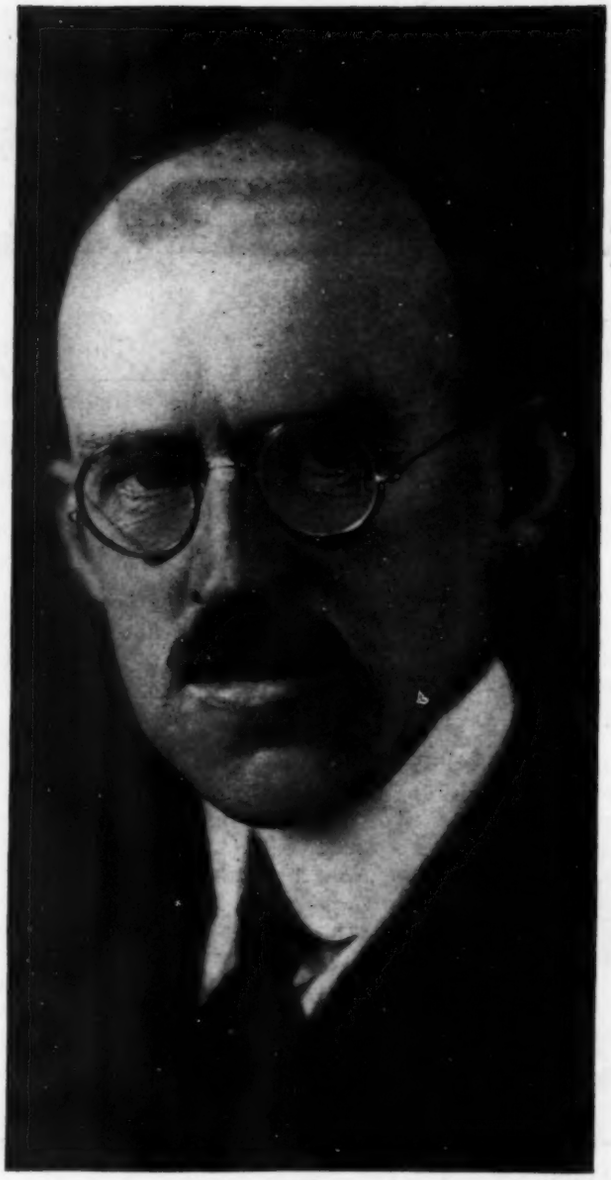
When in this sense, therefore, "investment equals savings," savings are not withdrawn from purchasing power and the Foster and Catchings paradox is resolved.

The second and more extended of Keynes' propositions is not so clearly self-evident. As a statement of fact it seems highly probable. Savings are at this moment rapidly accumulating in this country, not in banks and insurance companies alone, but as actual hoarding of currency. New investment is shamefully meagre; and the price level is lowering. But which is cause and which is effect? Or can perhaps any one of the three elements be used as an efficient cause at the appropriate time to affect the other two?

One thing is sure, and that is that the variation in price level tends to exaggerate and extend either a boom or a depression—but particularly the latter; for there is no incentive to investment in a falling price level. Perhaps things will be cheaper six months from now. Thus investment holds off, savings accumulate, and prices sag still further.

Another Aspect

But it seems to me that there is another aspect of the dictum that "investment must equal savings" which its proponent has failed to consider. Why is it not equally



RALPH E. FLANDERS

true to reverse the statement and say that savings must not exceed the possibilities of profitable investment? As a historical fact, did not immense masses of savings, individual and corporate, accumulate during the recent boom, circulate feverishly and uselessly in the New York call money market, and find themselves left homeless in the consequent unbalance between production and purchasing power? It was primarily withdrawn from purchasing power by the hope of speculative profits; but could any useful employment for this whole mass have been found in the domestic investment field without a corresponding expansion of purchasing power? Was it not this lack of possible use which fated the catastrophe?

We may see at this point that the American theory of the necessity for high wages to maintain prosperity still holds good. For dividends, speculative profits and other large scale financial returns go, on the whole, into the hands of those who can spend enjoyably only a portion of them. They must invest the remainder. And wages and ordinary salaries go, for the most part, into the hands of those whose needs are so insistent that they must spend most of them and can save but little.

Now the amount of money which was not expended, but was saved, in the summer of 1929 was tremendous; and most of it was not invested in the sense of being used to purchase capital goods. It whirled uselessly in stock speculation, or with equal uselessness (so far as industry is concerned) in the call money market.

We cannot of course say that if this useless money had been paid in wages it would all have been used to buy goods; but at least a much larger part of it would have, and that would have been better for business than using it as was done.

In these few paragraphs there has been sketched the outlines of a theory that is self-consistent, and agrees with the facts that we have experienced. It seems to have in it elements of common sense. Let us express our estimate of its value in that mild form, realizing that we are not specialized economists, and might find it difficult to uphold the idea in all its details in the face of expert criticism.

There is one piece of supporting evidence which has been brought forward by Dr. Virgil Jordan, economist of "The Business Week." In the winter of 1930 he calculated that the amount of unemployment existing at that time could roughly be accounted for by the drop in the production of capital goods (machinery, buildings, bridges, engineering construction, etc.), and by the diminished purchases of consumer goods by the workers dependent on the capital industries. In other words, this evidence tends to show that the recession was due primarily to a decrease in new investment or purchase of capital goods. These uninvested savings have been piling up ever since at one end of the process, though subject to diminution through attrition and the necessity for transforming into consumption at the other.

This evidence, if valid, not only supports the above theories, but indicates that businesses such as ours are the primary and principal victims of the business cycle, instead of being causes for its irregularities. The manufacturers of capital goods, in general, and of machine tools, in particular, can least of all afford to assume responsibility for this or any other severe business depression. While lending our every effort toward direct action for maintaining business stability, we must yet refuse to be put in a false position in the matter.

Price Levels

Let us return to Keynes' more complicated statement, that when the ratio of savings exceeds the rate of investment, the price level falls, and business is bad; and when the rate of investment exceeds the rate of savings, the price level rises and business improves. The truth of the first half of this statement has been daily demonstrated. Until within the past few days, at least, money was continuously accumulating, even to the point, as has been indicated, of an incipient hoarding of currency. New investment was practically nil; that is to say, for instance, that no one was buying machine tools. The price level was going down—wholesale prices, retail prices, rents, wages, real estate, everything.

There is a deadly serious element to this decrease in the price level. It manifests all the elements of a self-generating disaster. We might assume that lowered prices would increase the rate of consumption buying and capital investment, but it has done nothing of the sort. The element of caution has long been dominant. "Prices are going lower," the purchaser says to himself. "let's wait a while before we buy." The purchaser waits, prices go lower yet, and still further delay is justified. Where is the end of this discouraging process?

We were coming to the point where caution turns into fear, and fear bids fair to become baseless and senseless panic. These dangerous emotions are not without explanation. The continued fall in the price level destroys the value of all collateral. Farm values became worthless in support of their mortgages, ten years ago. City real estate followed suit later. Stock certificates, for anything except the call money market, have lost much of their usefulness. Bonds were on the way. The process has been stayed by the President's timely and energetic action. Is further action needed?

For an answer let us take the second half of the Keynes statement and transpose it so that it will read "When the price level rises the rate of investment will exceed the rate of saving and business will improve." It sounds sensible. Each one of us knows that if we controlled some share of those slacker millions in the metropolitan banks and a general rise began in the price level, we would start buying something. We would begin to consume or invest. And it is reasonable to believe that business would get better.

Then why not raise the price level? Perhaps if everybody in every line of business got together and made a concerted effort we could do it—wholesale prices, retail prices, rents, wages, salaries and all.

But, it won't work. It is being tried piecemeal without success, and it is hopeless to experiment on the grand scale. The forces of supply and demand are against us, and the commodity whose effective supply and demand is being measured against the general price level is gold itself. For example, that number of grains of gold which we call a dollar is just now worth to the farmer four bushels of wheat, but at other times only two pecks. Of course this is an illustration only, for it is the general price level which counts, not the individual commodity.

The vital question is whether the disturbance in the relative demand for gold and for goods is temporary or deep seated. If the former is the case, then a sudden reversal in popular psychology will really turn the balance. Such a reversal nearly took place on the announcement of the German moratorium, and may well be the result of the present encouraging action to put a broader foundation under our extended credit. In any event, such influences, if powerful enough, may stay the receding tide for periods of a year or two and give us a much needed breathing spell. But there is historical evidence for fearing more stubborn influences.

A few weeks ago Colonel Ayres took a short backward look at the depression, and a longer backward look at history, and announced that this is no ordinary business upset, but is instead a "major, secondary post-war depression" such as afflicted the world after the Napoleonic Wars and again after the mid-century disturbances of which our own Civil War was the focus. Like the wise man he is, Colonel Ayres takes his historical lessons in the backward view. But is it not just possible that he or some contemporary may, ten years hence, call our attention to the fact that the intractable lowering of the price level from which we will then be suffering, finds its counterpart in the post-war periods from 1820 to 1850 and from 1870 to 1900?

It seems probable that there is here involved something more than a temporary problem. We are driven

thereby to ask the momentous question—"Can the value of money (gold in our case) be manipulated, and thus effect the price level?"

This is a major question. In general, economists have said "yes," while American bankers and financiers are skeptical.

Recently support for these economists has come from an unexpected source. A news despatch from Chicago, dated September 15th (under a very unfair headline which savored of unrestricted inflation) announced a meeting of the American Farm Bureau Federation to consider some means of stabilizing the unit of value of currency. Later reports of the meeting itself referred solely to a project for paper money carefully regulated to maintain the price level. This would be accomplished by the rate of emission for raising the level and by retirement through taxation for lowering it.

Of course all of this is theoretically possible, but it would throw overboard the whole mechanism of our Federal Reserve System, which we are just beginning to hope to learn how to run, and which has unlimited opportunities for improved service. It would also lead to a varying exchange rate which would permanently unsettle all of our foreign commercial transactions. So this meeting, though intelligent in purpose and conception, failed of practical issue, if the newspapers gave a fair report of their proceedings.

An Invitation from England

But if our industrialists and financiers are unconvinced in this matter, those of England are not. For months past, by visits, interviews and magazine articles they have been urging our participation in this necessary work of financial control. The latest of these appeals has been made by Sir Josiah Stamp in an interview published since the English abandoned the gold standard. After reviewing the important part played by London in the international exchange operations (to play which part, by the way, our own money market as yet lacks the skill, experience and even the courage required) and indicating the serious effect on the foreign commerce of other countries of the devaluation of the pound, he went on to say that there must be international action for the steadying of the price level, and stated that the manipulation must be done "with a golden handle."

What has been the answer to this open, long standing invitation—and to the confidential invitations which we may be sure have been extended from time to time through diplomatic and financial channels? What the attitude of our Government may be, we do not know. A real appreciation of the seriousness of our case was indicated by arranging for the German moratorium. There appears to be some evidence of a willingness to scale war debts down in consideration of disarmament. But there is as yet no indication that there has been considered the necessity, or even the possibility, of checking the run-away price level directly.

The reaction of our financial leaders to this matter is, on the other hand, only too clear. It is taking two directions. One is the purely gratuitous assumption that England is leaning toward bimetallism, general abandonment of the gold standard, or some other financial heresy, and the other is the delicate intimation that our swollen store of gold in some way indicates a superior skill on the part of our own experts.

This notion that England is trying to lure us into unsound financial practices of some sort is being subtly instilled into all the headlines and into the news releases which refer to a possible (and inevitable) international monetary conference. This is foolish. Sir Josiah invites us to devise a mechanism which is controlled, not by the paper handle of the Farm Bureau, not by the gilded silver handle now being urged by Senator Borah of the silver-producing Rocky Mountain area, but by a "golden handle."

The wisdom of our entering on the proposed negotiations is based on necessity rather than on the feeling current among idealists that social control is fundamentally an international undertaking. It is my own belief that our prosperity lies largely in our own hands; but this question of the general price level and a stabilized foreign exchange is one of the few matters which can be settled only on an international basis.

Some Practical Steps

Perhaps this paper has wandered unduly from the beaten path of practical procedure. Let us, therefore, retrace our steps, and in a brief concluding summary indicate what practical actions are suggested by our excursion.

1. We should skillfully and wholeheartedly do all within our power to regulate by internal action the excessive fluctuations in business and employment to which our industry contributes.

2. While doing this, we should emphatically state that neither individual industries nor industry as a whole can take full responsibility for the fluctuations of business, which lie fundamentally in the balance between savings and investment; we should further point out that the equipment industries and the wage earner dependent on them bear the brunt of this burden, and that machine tool builders—being equipment builders to equipment builders—are particularly helpless in the face of general monetary conditions.

3. We should further call attention to the fact that the resumption of new investment on which our particular prosperity depends is also the key to the resumption of general prosperity; and that this resumption will not take place so long as a lowering price level gives hope of more advantageous purchasing later.

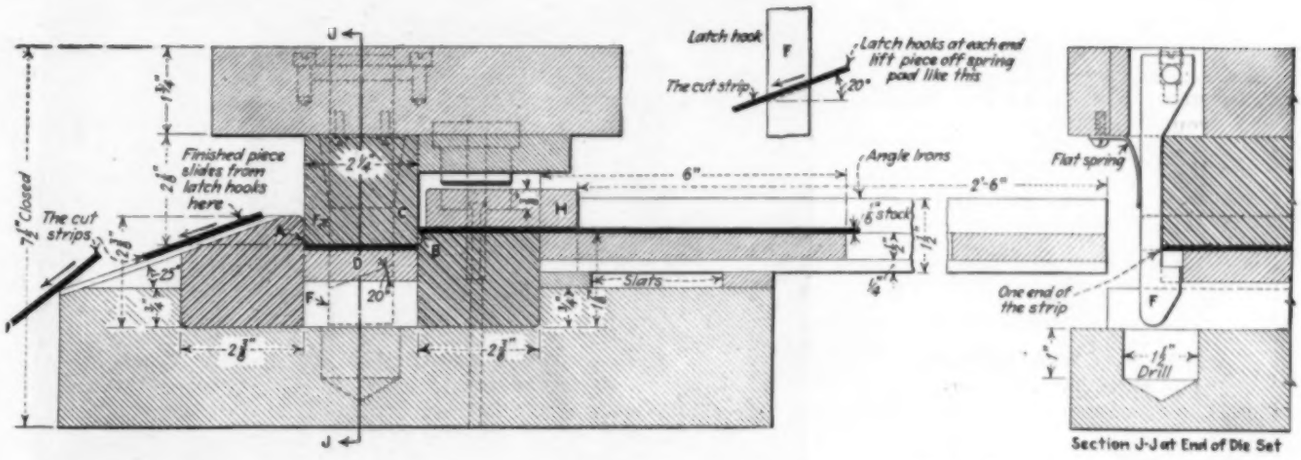
4. In addition, we must urge the evident dangerous effect of this continually lowering level on the value of all kinds of bank collateral, and consequently on the safety of the banking structure itself.

5. Noting the long standing difference of opinion between bankers and an important school of economists as to the practicability of controlling the price level, and noting the inability so far of our financiers to handle the situation by any other means, we must insist that the claims of these economists be examined.

6. As the immediate practical step to be taken, we must urge that our government join in a financial conference (not necessarily public) with England and France, having as one definite and major purpose the stabilizing of the value of international currency as indicated in the price level.

7. Finally, we should recognize the immediate practical interest which we and the workmen dependent upon us have in these matters; and in view thereof we should use every effort to bring them to the attention of other business organizations, including the Chamber of Commerce of the United States—all to the end that the action which seems so urgently necessary may be brought to a conclusion without further delay.

A Cutting-Off Die for Heavy Wide Stock



Six holes are perforated in the strip; it is then fed forward to be cut off

C. W. HINMAN
Chief Tool Designer, Kobzy Tool Company

THE accompanying sketch illustrates the press tools used for perforating and cutting off sheet steel stock in strips 2¼ in. wide and in lengths of 32 in. The material is ⅛ in. thick and is cut from sheets 32 in. wide.

This operation is not so easy as it appears on first thought, for the following reasons:

There must be a positive backstop *A* to feed the 32-in. stock against. This positive stop must be high enough above the cutting surface of the die *B* to act as a back-up for the cutting-off punch *C*, before it begins to cut. A spring pad is necessary under the cut strip to hold it in a horizontal position during the operation. Otherwise, when the cut occurs, the strip will naturally tip on its cut-off edge as an axis, and the result will be an angular cut, whereas a square-cut edge is desired. With this arrangement, when the punch ascends, followed by the work and spring pad *D*, there is no way to remove the finished strip automatically so that the sheet stock can be fed forward again. The backstop *A* is in the way. The strip is too long, and the tool is positioned in the press the wrong way to allow pushing it out endwise.

These difficulties are overcome by attaching two hinged latch hooks to the punch holder, one at either end of the strip *F*. These hooks have a 20-deg. slant in their hooking surfaces. Therefore, when the hooks ascend with the punch holder they lift the sheared strip from the spring pad *D*, and continuing upward, lift the work above the top of the backstop *A*, allowing it to tip to the 20-deg. angle and slide off on the inclined delivery table.

The perforating punches and holders are of Richard Bros. design and allow the quick removal of broken or short punches for replacement. Detail *H* is a strong spring stripper that holds the work firmly on the face of the die *B* while it is being cut off. It also strips the sheet from the six round punches that do the perforating.

The face of the cutting punch is, of course, ground to a shearing angle of a height about the thickness of the stock, from its center each way across the sheet to be cut. This slight shear does not distort the strip.

A frame of angle iron and cross slats, 30 in. long and the proper width, is constructed on the right-hand side of the die shoe for guiding the stock up to the tool.

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No one but a plant executive can know how hard it is to get appropriations for new machinery and equipment.

How one company sold its board of directors and kept it sold is the subject of the leading article for next week.

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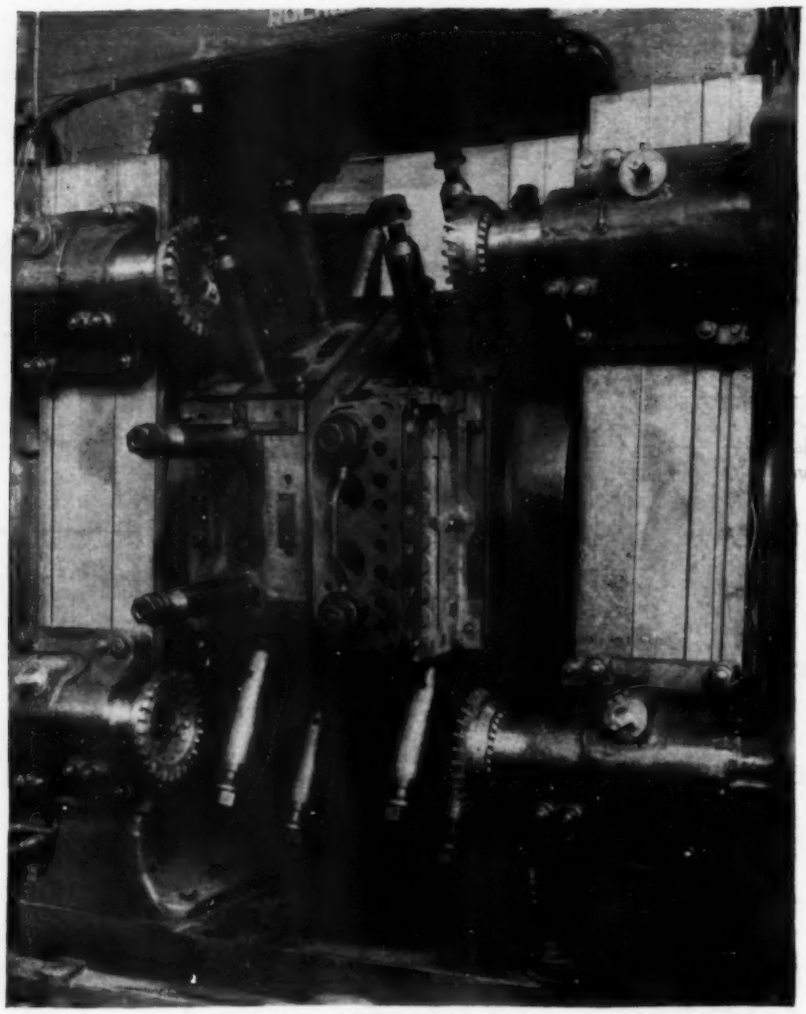
A. P. GWIAZDOWSKI
Asst. Professor of Shop Practice,
College of Engineering, University of Michigan



Continuous drum-type miller used for facing cylinder parts

Plymouth Machine Practice

THE depression has hit many plants in the automotive industry. Reception halls are empty, even of salesmen. Few employees' cars are parked in factory yards or on adjoining streets.

The Plymouth plant is an exception to all this. There the air is vibrating with mechanical and human energy. Engineering knowledge has coordinated and timed the mental and physical efforts of thousands of men and women with almost as many machine tools, conveyor wheels, and links. This coordination produces, at the end of an assembly line, two finished cars a minute.

The Plymouth plant is 376 ft. wide and 2,400 ft. long. The total area under the roof is 902,400 sq.ft. Forty-four hundred employees transform forgings, castings, stampings, and sub-assemblies into a low-priced, yet luxurious, self-propelling vehicle.

The army of machine operators and assemblers produce only a small portion of the component parts of the Plymouth car. The energies of thousands of men, outside of the assembly plant, are used to guaratee a continous flow of castings, forgings, finished parts, subassemblies, frames, and bodies. Transmissions and differentials are made in the Dodge plant. The Dodge foundry furnishes castings, and the Dodge forge shop supplies forgings. The Briggs Body Corporation is operating its Mack Ave. plant day and night making bodies for Plymouth cars. Steering gears, carburetors, and frames are also bought from outside firms. The incoming materials are so well timed that the supplies on hand are sufficient for only two days' production and assembling.

"Are they really putting good stuff in their cars?" asked one visitor at the Plymouth sales courtesy desk.

Here is part of the answer: Radiator shells and shields are polished, buffed, copper-plated, nickel-plated, chrome-plated and then buffed again. A battery of Gardner grinding and buffing machines runs day and night, giving employment to about 120 men. All parts to be nickel-plated and chrome-plated pass through this department. The processes used, and the workmanship are the same as in the production of radiator shells for medium- and high-priced cars.

Thirty-eight machining operations are performed on the cylinder block. The sequence of operations and the

equipment used are practically the same as in any plant producing high-priced cars. The cylinder blocks first are sprayed with heat- and rust-resisting lacquers before the tops and bottoms are milled on Newton continous heavy-duty millers. The speed of the milling cutters is about 40 ft. and the feed is about 6 in. per min. High-speed steel inserts are used for rough cuts, and Stellite inserts are used for finish cuts. The speed of the finish cutters is increased to about 50 ft. per min.

From the miller the cylinder block moves by gravity to a two-spindle drill press, where two $\frac{3}{4}$-in. diameter locating holes are driled and reamed. From the drill press, the block moves to the Newton continuous drum type milling machine, where both ends are milled. An Ingersoll continuous drum-type miller is used for milling pads on both sides of the cylinder block. The block then travels to a Putnam four-spindle drilling machine, and the piston bores are rough and finish bored. The pilots of the boring tools are protected against wear by six inserts of high-speed steel fastened with set screws to the periphery of the guiding shaft. Ball bearing pilot bushings prevent "freezing" of the two mating parts.

From the boring operation, the blocks are moved to the Newton "rise and fall" miller, and the crankcase bearings are straddle milled. The hydraulic feed provided for vertical travel of the machine table gives flexibility and rapid return; the result is high production. Drilling and tapping of plug holes and milling seats for bearing caps are followed by reaming and chamfering of piston bores.

Common automobile practice is to use floating reamers

Machining Operations on "X" Cylinder Block

Oper. No.	Operation	Time per Piece (Minutes) Automatic Machine Cycle "X" Plant
1	Mill locating spot	1.27
2	Mill top and bottom	3.00
3	Drill and ream locating holes	1.32
4	Rough bore main and cam bearings	1.89
5	Semi-finish bore main and cam bearings, rough and finish bore starter hole and generator saddle	1.50
6	Rough bore cylinder	2.15
7	Mill ends, fan pad, and starter pad	2.33
8	Mill both sides of case	2.03
9	Straddle mill main bearings and mill oil sling groove	1.04
10	Face cam bearings front and rear	....
11	Drill and ream breather hole	1.12
12	Finish mill water pump pad	.67
13	Drill top and both ends	1.57
14	Drill tappet holes	1.23
15	Finish bore main and cam bearings	1.30
16	Semi-finish ream tappet holes	1.08
17	Chamfer tappet holes	....
18	Drill bottom and both sides	2.13
19	Finish ream tappet holes	2.14
20	Chamfer bearing cap screw and bearing shell screw holes	....
21	Chamfer bottom of cylinder bores	1.75
22	Finish bore cylinders	1.56
23	Chamfer top of cylinders	....
24	Drill, spotface bore, and ream distributor hole	4.00
25	Finish ream cylinders	7.60
26	Drill six oil holes main to cam bearings drill and spotface two dist. lock screw holes — drill 16½ in. holes. Drill and spot-face rear cam bearing lock hole	.61
27	Tap bottom and both sides	1.11
28	Drill eight water holes in top, tap two distributor lock screw holes, tap one rear bearing lock hole	....
29	Tap top and both ends	1.73
30	Lap cylinder bores	1.20
	Total time from floor to floor, min	47.33

Machining Operations on Plymouth Cylinder Block

Oper. No.	Operation	Standard Time per Minute
1	Rough mill top and bottom	5.14
2	Drill and ream two locating holes	1.22
3	Rough and finish mill ends and c'sink locating holes	3.32
4	Rough bore cylinders	1.66
5	Rough and finish mill manifold and valve dust cover seat, rough finish mill serial No. Pad, water inlet boss and cylinder bore marking bosses	1.70
6	Straddle mill crankshaft bearing faces	.77
7	Rough mill crankshaft brg. slots	1.02
8	Bore and c'bore welsh plug holes and rough bore c'shaft holes in each end	.84
9	Drill (8) valve tappet holes and throat holes	1.89
10	Drill (8) valve stem holes and (2) water holes	Time included in Oper. No. 170
11	Drill 9¼-in. angular holes	1.03
12	C'bore underside of valve stem guide holes	.96
13	Rough ream (8) valve tappet holes and (8) stem guide holes	.96
14	Chamfer top of valve tappet holes and semi-finish ream valve stem guide holes and tappet holes	.96
15	Line ream valve guide and tappet holes and ream exhaust and intake valve and throat holes and hand chamfer	1.92
16	Press $\frac{5}{8}$-in. steel ball through tappet holes to burnish	.67
17	Drill oil supply line holes	1.33
18	Drill, c'bore spotface and tap $\frac{1}{8}$ in. x 12 hole drill c'bore (4) valve port holes drill 1$\frac{11}{32}$-in. hole and $\frac{29}{64}$ oil hole	3.84
19	Drill all holes in both ends and chamfer 14 holes in one end	1.30
20	Drill all holes in bottom and oil filler side and c'sink holes in bottom and drill all holes in top and drill holes in manifold side	2.47
21	Drill 3 $\frac{21}{64}$ holes to cam brg. and 1$\frac{1}{4}$ angle hole in rear cam bearing	1.39
22	Chamfer 5 holes in rear end and 15 holes in top	1.21
23	Chamfer bottom of cylinder bore	.96
24	C'bore 7 main bearing stud holes ream 3 main bearing holes, c'bore oil line supply hole by air drill	.88
25	Tapping 10 holes in manifold side and 5 holes in oil filler side	1.50
26	Tap 6 holes in rear end, tap 15 holes front end, $\frac{3}{8}$ std. pipe tap in oil supply line	1.05
27	Tap 15 holes in top and 12 holes in bottom	1.96
28	Finish boring cylinders	1.06
29	Drill and ream oil filler holes	.72
30	Drill oil level indicator hole, drill and tap hole for oil filler	.96
31	Drill $\frac{43}{64}$-in. hole $\frac{7}{16}$ in. deep, $\frac{1}{2}$ hole thru tap with $\frac{3}{8}$ x 10	.96
32	Finish milling bearing cap slots	.99
33	Finish ream cylinder bores	1.24
34	Rough lap cyl. bore and hand chamfer	2.35
35	Finish lap cylinder bores	1.78
36	Drill ¼-in. angle hole in ventilator, chamfer and hand re-tap $\frac{3}{4}$ x 16 thread for oil line	.96
37	Mill all slinger grooves	.96
38	Re-tap main bearing stud holes	1.06
	Total time, min	55.16

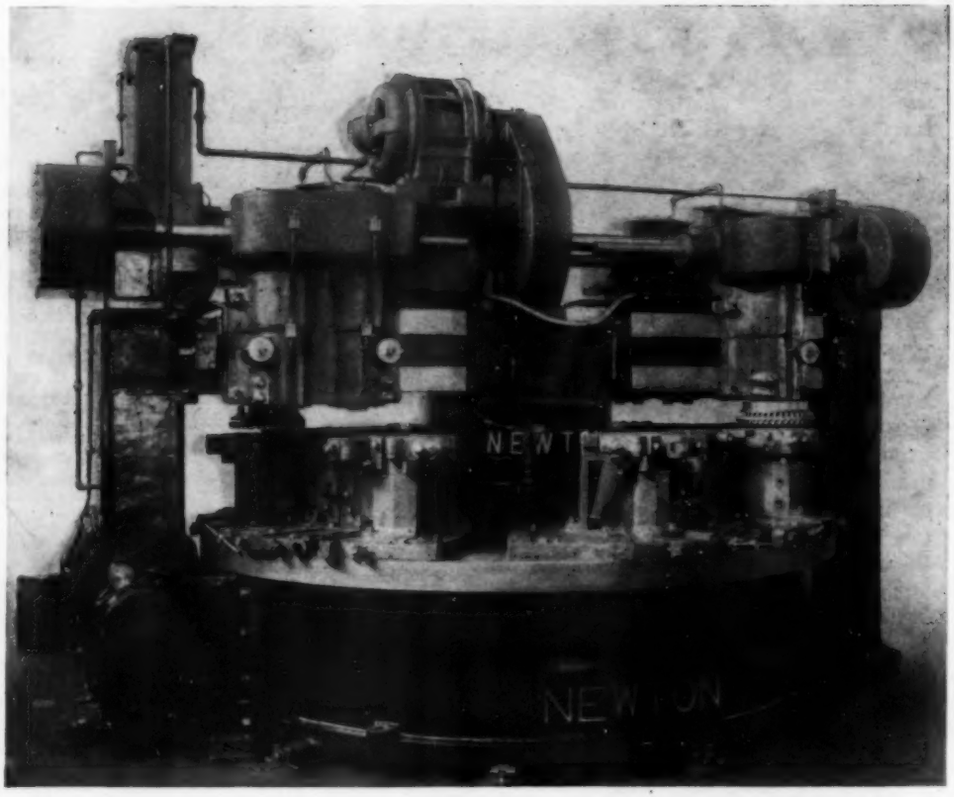


Table miller for Plymouth motor parts

and to keep cylinder blocks in one position. Generally, all piston bores are reamed at the same time with four reamers in a four-spindle drilling machine. Plymouth, however, adheres to the old-time method of using a single-spindle Foote-Burt drilling machine. It also reverses the performance of tool and work by permitting the cylinder block to "float" while the reamer is held solid. A copper bushing, the size of the reamed hole, separates the reamer and a counter-sink. This multiple-purpose tool, therefore, performs two operations—reaming and chamfering. The revolving, solid reamer adjusts the cylinder block, and according to the foreman in charge, the concentricity and the distance between center lines of piston bores are accurate within 0.0005 in. The reaming operation is followed by rough and finish honing.

It is interesting to know that the most important parts of a cylinder block, namely the piston bores, are machined by Plymouth with more operations than those of some of the higher-priced eight-cylinder cars. For instance, a well-known manufacturer of "eights" rough bores, finish bores, finish reams, and hones piston bores. Plymouth rough bores, finish bores, finish reams, rough hones, and finish hones the bores.

The first law of tool engineering, which states that the sub-division of operation is a function of accuracy, is closely followed.

A comparison of the operation sheets of the above-mentioned manufacturer of eight-cylinder cars with that of Plymouth is as follows:

The time used to perform operation No. 2 by manufacturer "X" and the time used to perform operation No. 1 by Plymouth throw a considerable light upon present day cutting materials. The cylinder block of manufacturer "X" is 36 in. long or about 35 per cent longer than the Plymouth cylinder. The hardness of this particular "X" casting is about 200 Brinell, and it is far from being uniformly hard. There are many thin, webbed and chilled sections to machine, especially on the crankcase side. Notwithstanding the difference in size and the physical and chemical character of two castings, manufacturer "X" mills top and bottom in 3.00 minutes from floor to floor, while Plymouth performs the same operation at the rate of 5.148 min. Cemented tungsten-carbide tools and up-to-date equipment are responsible for this difference in machining times. Plymouth, as stated above, uses a high-speed steel and Stellite combination, while manufacturer "X" prefers tungsten carbide. Plymouth gets 45 to 60 ft. per min. speed and 6-in. feed, with a $\frac{5}{32}$-in. cut, while the second manufacturer rotates his 12-in. carboloy-tipped milling cutter at 135 ft. per min. and his feed is 24 in. per min. with the same depth of cut. The average number of pieces per grind of carboloy cutter is 120 as against 40 to 45 with the high-speed, Stellite combination.

A conveying system, having a total length of five miles, supplies all necessary parts to the assembly line, which is 1,650 ft. long. Every motor is tested and runs one hour and a half under its own power before it is delivered to the assembly line. The line travels at the rate of approximately 23½ ft. per min. while the car is being assembled.

Inspection is careful and rigid. There is one inspector for every seven men on an assembly line. The plant is clean. Every machine tool is busy. Scrap corners and over-stocked spots do not exist. The delivery of materials is so well timed that a very small amount of stock is kept on hand in the sub-assembly departments. Though there is enough space for a thousand bodies, only four or five hundred are waiting to be delivered to the assembly line.

Both on the production and on the assembly line the men are between twenty and forty-five years of age. Machine tool operators know little or nothing about tools, speeds, and feeds. When a tool fails, the operator simply replaces it with another one and puts the dull one aside.

High-speed steel for rough cuts and Stellite for final cuts are used on all jobs. Cemented tungsten carbide (Carboloy) is used on two aluminum jobs only. The production methods are not revolutionary, but on the contrary, rather conservative.

Heat-Treating Equipment in a Modernized Plant

SATISFACTORY heat-treatment demands modern equipment. Though many plants get by with furnaces and methods that make success depend almost entirely on the experience and skill of the steel treater, strict uniformity of product is impossible under such conditions. Add to this the growing demand for better heat treatment to secure higher qualities, the normalizing of forgings and castings to relieve internal stresses, greater care in annealing to improve the cutting qualities of the harder materials and the minimizing of distortion in the hardened piece—and the need for the best heat-treating equipment available becomes apparent.

As an example of this growing need for greater uniformity and better results in parts that make up modern machinery, the plant of R. Hoe & Co., Inc., is perhaps typical. This is true of both the printing press and circular saw departments. Cast iron gears have given way to steel in many places, because of the necessity for strength, wearing quality and quiet operation.

Heat treatment is not left to chance or to the discretion of the individual. The steel is bought to specification and the desired heat treatment is stated on blueprints and on the route card copy that accompanies them. The first blueprint, Fig. 1, gives the rough machining dimensions and the temperature for normalizing. A second blueprint, Fig. 2, shows how the piece is machined before carburizing and gives the proper treatment to secure the $\frac{1}{16}$-in. case desired. After carburizing, the piece is machined as called for in Fig. 3. The outside of the case is not disturbed. The piece is then heated and quenched as directed

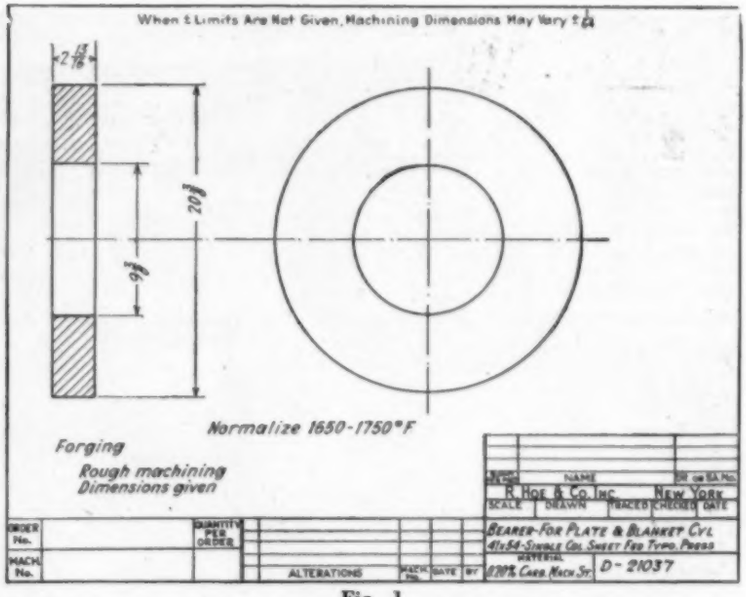


Fig. 1

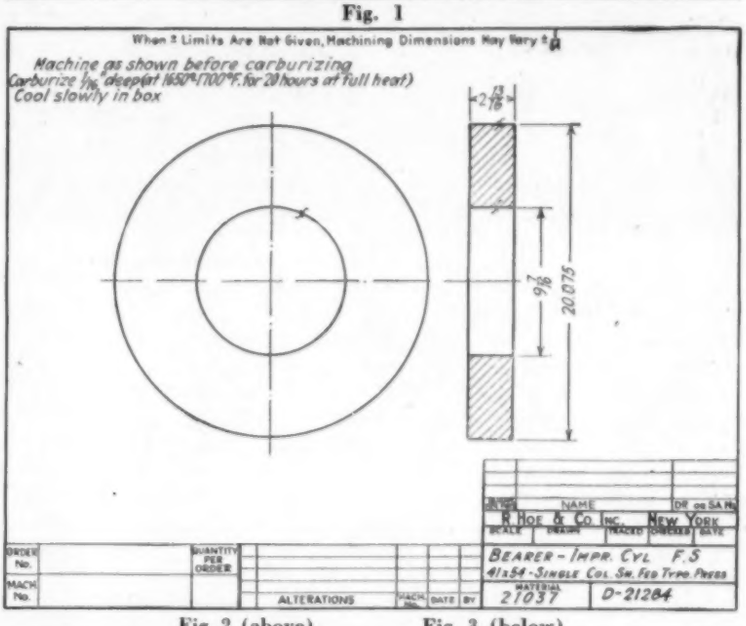

When ± Limits Are Not Given, Machining Dimensions May Vary ± 1/64
Machine as shown before carburizing
Carburize 1/16" deep (at 1650°-1700°F. for 20 hours at full heat)
Cool slowly in box
2 13/16
9 7/8
20.075
R. HOE & CO. INC. NEW YORK
BEARER - IMPR. CYL F.S.
41x54 - SINGLE COL. SH. FED TYPO. PRESS
21037
D-21284

Fig. 2 (above)

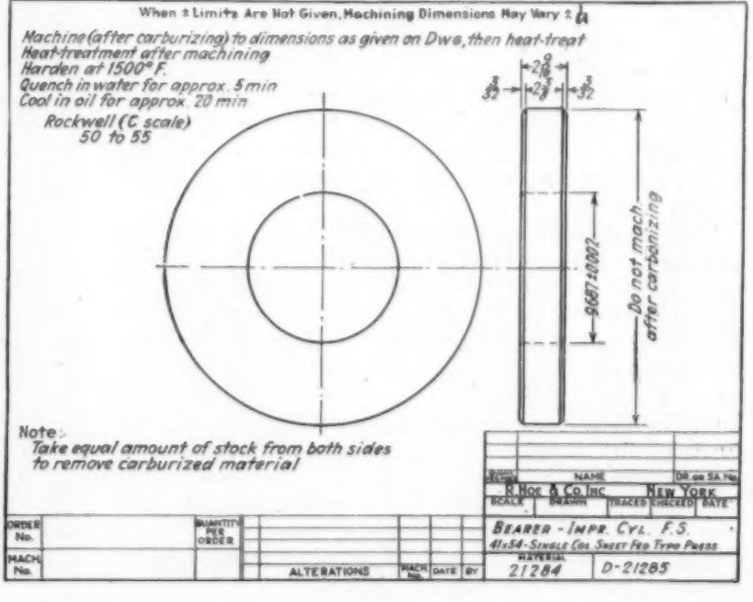

When ± Limits Are Not Given, Machining Dimensions May Vary ± 1/64
Machine (after carburizing) to dimensions as given on Dwg, then heat-treat
Heat-treatment after machining
Harden at 1500° F.
Quench in water for approx. 5 min
Cool in oil for approx. 20 min
Rockwell (C scale)
50 to 55
2 9/16
2 7/8
3/32
3/32
9.667±.002
Do not mach after carburizing
Note:
Take equal amount of stock from both sides to remove carburized material
R. HOE & CO. INC. NEW YORK
BEARER - IMPR. CYL F.S.
41x54-SINGLE COL. SHEET FED TYPO PRESS
21284
D-21285

Fig. 3 (below)

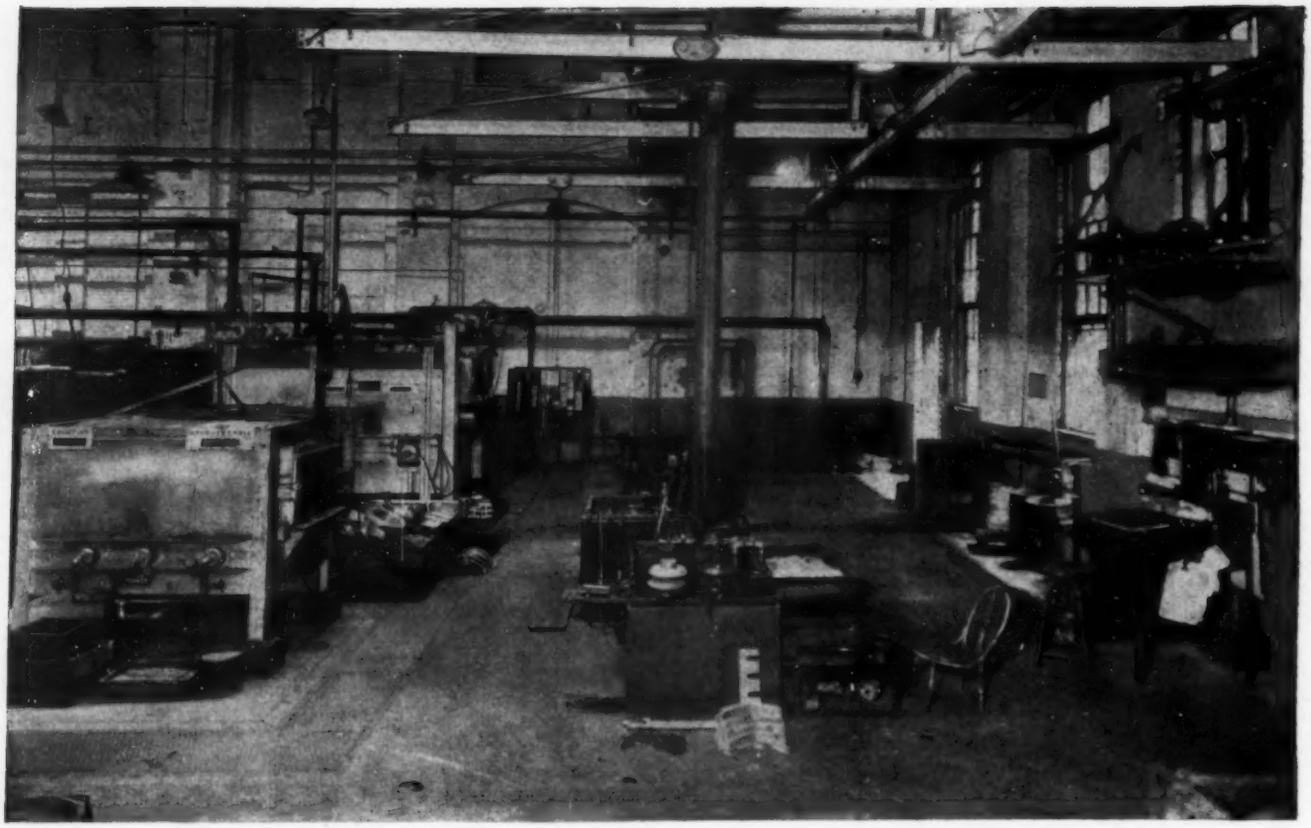


Fig. 4—New surface combustion furnace with typical work beside it

to give the hardness designated. A fourth blueprint, not shown, gives the final grinding operations that produce the finished piece.

Gears are handled in a similar manner, one blueprint calling for a normalizing temperature of 1,600 to 1,700 deg. F. The blanks are then annealed to 1,400—1,450 deg. F. The second print also gives the dimensions for rough machining, this gear being 18 in. in diameter. After it is rough machined, the gear is hardened by heating to 1,450 to 1,500 deg. F. quenching in oil and drawing to 450 to 500 deg. F. Following this the gear is finished turned, bored, broached, drilled and tapped while the teeth are rough cut or gashed. Two generating cuts are then taken. As this is done after hardening, all distortion due to heat treating is eliminated.

Some of the castings used, such as those for housing large anti-friction bearings which contain a large percentage of steel, are also normalized after being rough machined. Here again the heating must be uniform and closely controlled as to time and temperature for best results.

Two gas-fired furnaces have been installed to handle this work. They are automatically controlled by suitable instruments so that the continuous charts show remarkably close heat regulation. Large quenching tanks are also installed in front of the furnaces with suitable provisions for handling the work when ready for cooling. A special cooling system is used to regulate and maintain even temperature of quenching oils. These furnaces, together with the quenching tank and the overhead trolleys, are shown in Fig. 4. Fig. 5 shows the heat control with its continuous record, located right over the foreman's desk.

The circular saw department requires two types of furnaces, one for the large saws and the other for the drop-forged teeth that are inserted in the rim. The saws require large capacity, both as to furnace and quenching, though the volume of metal to be heated and cooled is not large.

In hardening the teeth, however, a rotary furnace is used to secure continuous production. Here an addition has been made on the quenching end in the shape of a bucket elevator that goes to the bottom of the tank and scoops up the hardened saw teeth after they have been cooled. The elevator conveyor raises them to the top

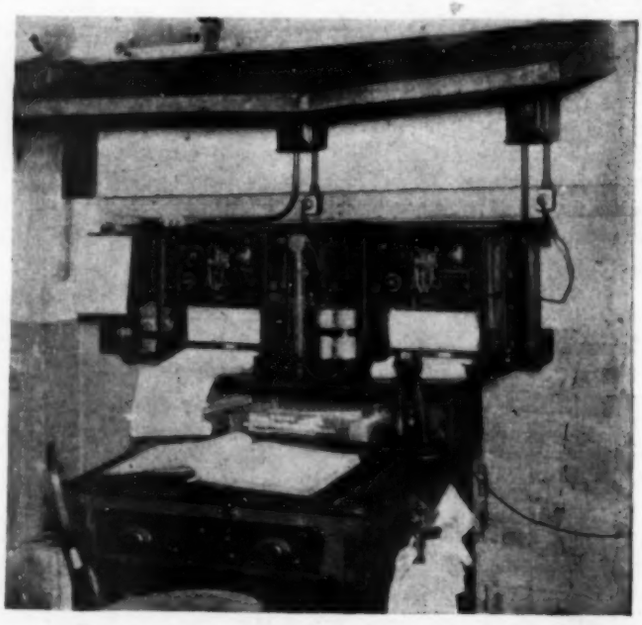


Fig. 5—Continuous recording control apparatus over foreman's desk

and dumps them, as the buckets go over the top, into the slide that delivers them ready for inspection and final grinding.

Great care has been taken to secure positive control over all heats, and quenching oil is also maintained at a constant temperature. Much pack hardening is also done, high-grade commercial carburizing material having replaced bone, leather and other ingredients of days gone by. Lead and cyanide pots are also available, although the Aerocase process is replacing cyanide to a large extent where only a surface hardness is desired. This method is said to give a deeper case than does cyanide, in a given time.

Cutting Materials—Yesterday and Tomorrow
Discussion

HARRY SHAW
Consulting Engineer, Heywood, England

Various writers have boosted tungsten-carbide tools, and seem to have been hypnotized by the wonderful results obtained. No doubt it is impressive when we consider that a tungsten-carbide tool will last for days, perhaps weeks, without grinding, and remove steaming blue-hot chips at many times the speed possible with other types. Indeed, so impressive it is, that one might be pardoned for saying, "Tungsten-carbide will cause a revolutionary change in machine shop practice." Perhaps it will, but not in the way that most people believe. The change will come because tungsten-carbide brings to light glaringly faults which previously were not obvious.

To those firms who are considering adopting tungsten-carbide, the writer would first say, "Examine carefully your present methods of production, and find out what percentage of the total working hours of each machine are occupied in removing metal."

Three years ago when observations were made in a well organized, machine tool works, working full time, and employing Stellite and super high-speed steels, it was found that never more than eighteen per cent of the machines were running at a time.

Therefore, and the writer thinks most readers will agree with his figures, not one-fifth of the total time on wok for machine tools, gas and oil engines, automobiles, and on ordinary small general work, is spent in removing metal, the rest being employed in setting up, cleaning the machine, traversing the tools up to the work, gaging the work, and the hundred and one other time-consuming operations entailed in general machining. So that, were it possible by using new cutting materials to reduce the cutting time to zero, it would be impossible to save more than twenty per cent of the total time by this means only.

When it takes, say forty minutes to set a piece of work up in the machine, select and put into operation the required feeds and speeds, gage the work between cuts, set the tools and feed them up to the work, perform all the other necessary work, and ten minutes to remove the metal, the non-cut time does not impress itself strongly on the mind. But when, because of the use of tungsten carbide, the metal is removed in one minute, that forty minutes of non-cut time is conspicuous, and so machine tool users are beginning to call for machines and equipment that will reduce the non-cut time.

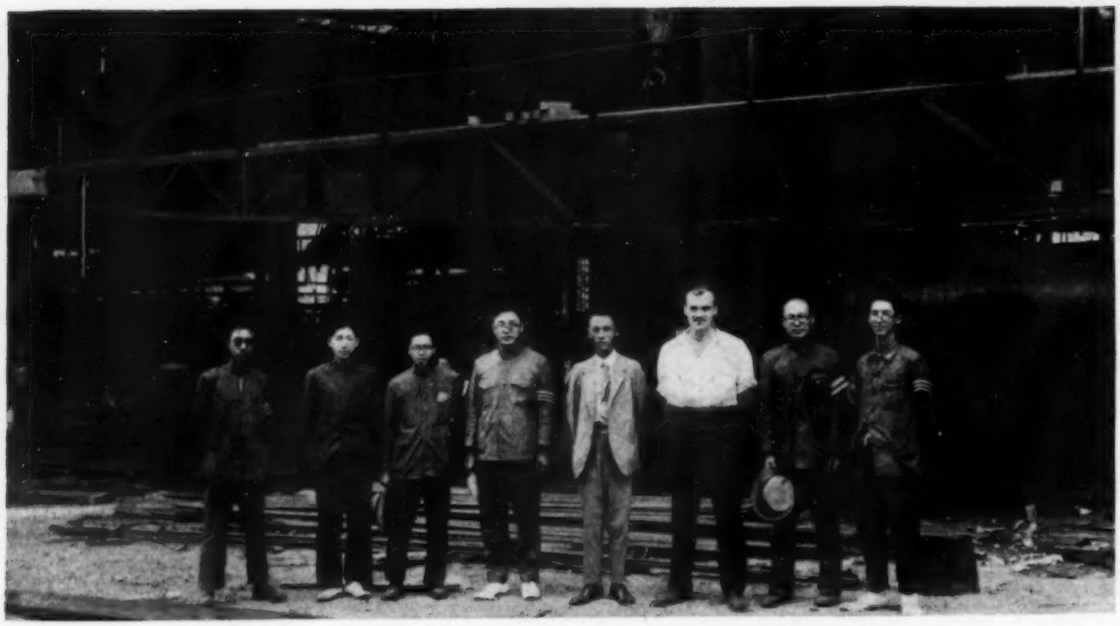
Most writers, in common with A. G. Baumgartner (*AM*—Vol. 74, page 929) and Frank W. Curtis (*AM*—Vol. 74, page 755) state that before tungsten carbide can be used to its full advantage machine tools must be made more rigid and vibrationless, and with higher spindle speeds. This may be so, but of still more importance to the progress of production engineering is the improvement of machine tools in the versatility of their setting up and the speed of their operation.

There is ahead of us a period when machine tool builders will endeavor to design their products so that instead of being a secondary consumer of time, as at present, metal removing will become a primary consumer. The beginning of this development can be seen in the incorporation of quicker work-holding devices, such as pneumatic, hydraulic, and electric fixtures and chucks; of quicker means of traversing the tool up to the work; of more facile means of changing speeds and feeds by single-lever control instead of by pick-off gears; of quicker means of gaging the work, as exampled by the Krupp and Pratt gages, where the gaging is done while the work is still moving. We may yet see machines built in which the size of the work is measured, while still moving, by light interference methods, and more machines will have to be developed that employ the automatic sizing principle used in some grinding machines. We may have more rapid means of removing the cuttings, probably by means of conveyors; quicker ways of disposing of the finished piece; means for lightening the work, so that the machine can be operated at full capacity without unduly tiring the worker.

Tungsten carbide will confer its blessing on humanity, not because of its greater cutting speed alone, but because of the light it will shed on the non-cut time, and so speed up the progress that is slowly being made. The majority of work does not entail the removal of a vast amount of metal, a condition where the direct gain from tungsten carbide would be great.

Portable Conveyors Between Operations

Portable conveyors may be used to advantage wherever two consecutive operations can be set up on adjacent machines. They speed production, conserve floor space, save labor handling material, and release from one to two trucks and tote boxes for more important uses. One unit of this type is installed in the press shop of the Motor Wheel Corporation, Lansing, Mich., for taking pieces from the rear of one press and delivering them continuously to the feed table of an adjacent press. The "booster" consists of an inclined, cleated belt conveyor with small drive motor and reducing gear mounted on a light framework with truck wheels at one end and caster wheels on the other. It is about 6½ ft. long by 7 ft. high. A removable apron at the discharge end can be adjusted to any length, height or angle, and the "reach" of the unit extended thereby. The hopper that feeds the chute at the lower end is similarly designed. This hopper should be as small and low as possible. Another similar unit is used at the Philadelphia plant of the Paul & Beekman Mfg. Co. It has a cleated belt likewise. Spacer bars and short supporting arms form the framework and also support the gear-reduction driving motor. Thus the unit can be hung on one press table edge with its hopper under the adjacent machine, or can be hung over a tote box edge.



The author and a group of Japanese welding engineers and technicians, standing in front of the arc-lengthened crane. Fifth from the left is Prof. Takesi Okamoto, outstanding Japanese welding authority

Arc-Welding in Japan

ANY consideration of the efficiency of arc welding in Japan must be tempered with the realization that the Japanese are an oriental people and have all the traditions and customs peculiar to the Far East. Reconcilation of American and European efficiency with Japanese easy-going ways of living and thinking often results in a mild sort of chaos. We cannot judge the Japanese by our standards, but must rather judge their industrial progress and efficiency by their own standards.

The Japanese are probably the most progressive of the eastern peoples. This is due to an intelligent leadership which has recognized the value of American and European industrial organization and methods. The result is a somewhat higher standard of living and a more prosperous nation.

It is natural that the Japanese should be large users of arc-welding. Their engineers studying in America, search for the most modern methods in every industry and upon returning to Japan set about to imitate them. Arc-welding is used in Japan in almost as many applications as in this country; ships, buildings, pipe, pipelines, and machinery all being welded. Industrially, the Japanese cannot approach American efficiency, for while labor is cheaper, costs are increased by slow leadership and poor tools.

The Japanese executive and engineer is the product of a caste society. While he may be trained in several universities, including the best in the world, he is not equipped with actual shop experience. This is of vital importance, as the stories which come out of the Soviet Republic indicate (where the same situation exists, but for a different reason). The purely theoretical engineer cannot realize fully the value of skilled labor, shop "kinks," good tools. This is not to be taken as a criticism of the Japanese, for these university men are so learned as to believe in welding soundly and thoroughly, which many of our purely shop-trained industrialists do not. It is difficult, however, for the Japanese to put their faith into practice.

Labor in Japan is not paid very much, but it is treated with the utmost courtesy. To lose one's temper is a sign of insanity and low morals. No one is ever "bawled out" in a Japanese shop; no one is ever spurred to greater haste by his foreman. The worker can lay off for a few days and return without an explanation—without losing his job. We do not condemn this gentle practice, but cite it as a factor to be considered in the industrial picture.

Japanese welder operators are extremely skillful. They begin as apprentices when boys, receiving $20 a year while they learn. A full-fledged welder is paid about $1 a day, and he works in his stocking feet, with light gloves and a hand shield.

The welding equipment used is mainly the old a.c. type, with a few modern d.c. machines. The cost of the American or European equipment is in many cases prohibitive. Unlike Australia, where the coated electrode is used in numerous applications, this type of rod is rare in Japan. Several American electrodes are used, but

MAURICE TAYLOR
Welding Technician, The Lincoln Electric Company

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World interest in the Far East adds timeliness to this discussion of Japanese welding progress. The author has just returned from a supervisory visit

many of the companies make their own wire. This native wire is usually of poor quality. One company produces a coated electrode which "shields" the arc, but the presence of borax and other elements in the flux are as hard, and as easy to remove, as baked enamel. The small-capacity machines allow the use of only small-diameter wires, and where successive beads need be applied this slag forbids the use of this type of rod.

The $\frac{1}{8}$-in. and $\frac{5}{32}$-in. diameter electrodes, in use in most applications, require the running of seven to nine beads on a joint which would take but one bead of metal from a large diameter "shielded arc" electrode of the type used in this country.

In spite of these difficulties welding progresses, labor is so cheap that the additional time is not considered, although the cost of electrode runs very high. In one pipe factory, the cost of electrode is 75 per cent of the cost of manufacture.

One accompanying photograph shows a 60-ft. overhead crane. This crane was originally a 30-ft. unit, but it was cut into halves and a 30-ft. section welded in the center. New rails and fittings were fused into place with the arc. The resulting job was as neat and strong as any to be seen in this country. It is typical of the Japanese engineer that no question should have entered his mind when the larger crane was needed. Rebuilding of the old crane was the accepted solution to the problem.

The author was privileged to repair an 80-ton forging hammer with the shielded arc process. The holding arm of this unit, a heavy forging, cracked and a replacement would have meant months of delay while a new unit was shipped from abroad. After V'ing out the crack and filling it with metal, a steel plate was tied across the fracture and fused into position. The machine was out of service but two hours, and after four weeks of continual operation did not show the least sign of failure.

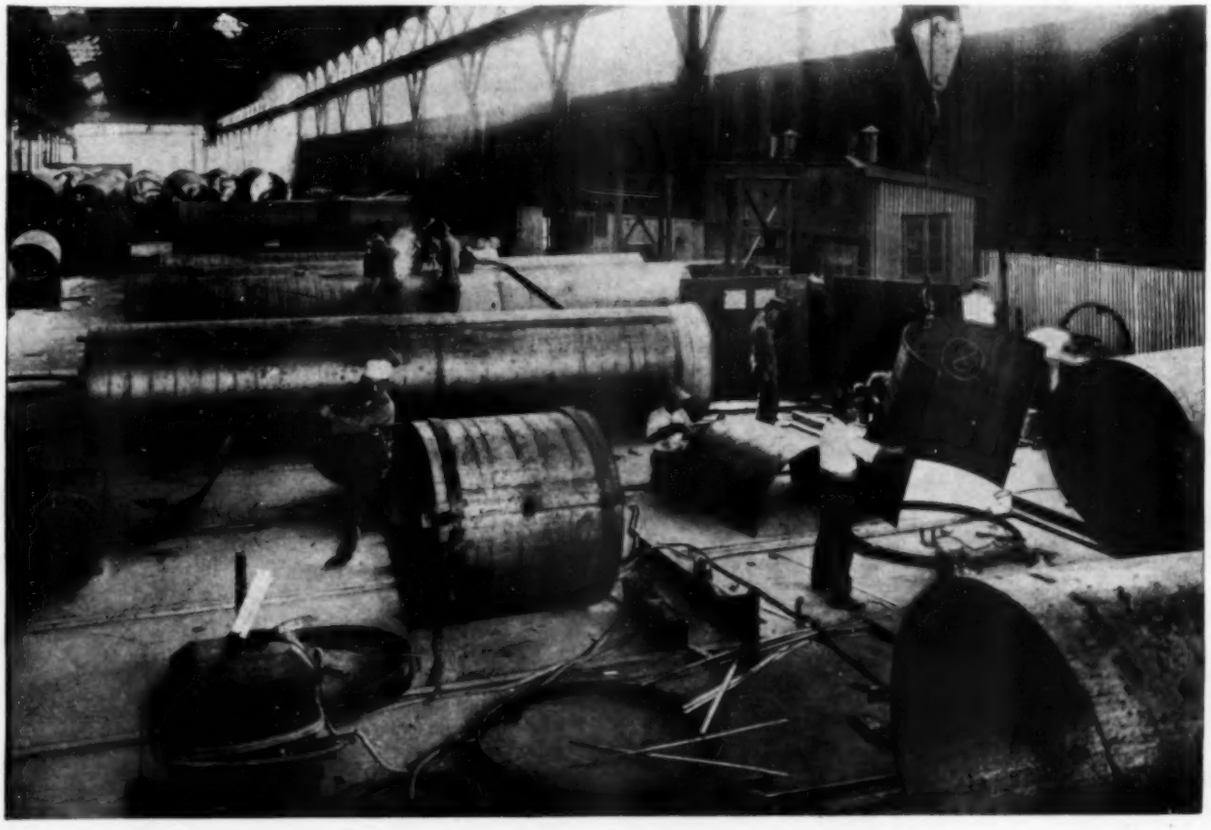
The installation of two tractors for use with the Electronic Tornado process of automatic welding occupied much of the writer's time while in the employ of the Kawasaki Dockyard Co. at Kobe. These tractors are used in the manufacture of large-diameter water pipe for the new Tokyo water supply system, and the setup is the same as that used in American pipe factories.

The pipe is made in three diameters, 1.3, 1.5 and 2.1 meters. The sections are composed of two plates rolled and fused together with a double pass, one pass on each side of the seam. In spite of the low-carbon steel used for these pipes (0.8-0.10 carbon content) test samples pulled at over 70,000 lbs. per sq.in. and several coupons pulled at 80,000 lbs. per sq.in. The ductility of this weld metal was better than that of the plate.

This pipe is flanged hot in a heavy press, and tested, after flanging, at 250 lbs. hydrostatic pressure. In the field the sections are tied together with welds on both the inside and outside of the pipe. Seven beads are required on the inner seam, and as this is done with Japanese electrodes and machines, much of the overhead welding is very difficult. It is safe to assume, however, that heavily coated American electrodes will be used for this work as soon as machines can be supplied with enough amperage to insure penetration.

The Japanese are extremely "welding conscious." Even with a society which is not well adapted to our industrial high-pressure methods, they are bound to gain the greatest efficiencies from welding. So far they are hampered by much obsolete or inefficient equipment, but this situation will not be allowed to exist for long. The Japanese are ten years ahead of us in their enthusiasm and belief in welding; ten years behind in equipment and method; but the first condition will solve the latter.

Electronic Tornado installation at the pipe factory of the Kawasaki Dockyard Co., Kobe, Japan



Ideas from PRACTICAL MEN

Combination Press Tools

JOHN J. MCHENRY

Many formed parts that are ordinarily made in two or more press operations can be made at a lower cost in inexpensive and conveniently operated combination tools. As instances, the parts *A* and *C* in Figs. 1 and 2, respectively, are typical illustrations. There is no cut-off punch used in either instance, the cutting-off operation being one of shearing, thus eliminating waste of stock.

Part *A*, Fig. 1, is made in the tools illustrated in that figure. At the first stroke of the press about $\frac{1}{16}$ in. is sheared from the end of the stock to square it. Also the two holes are pierced. Afterward, the stock is advanced to the stop, and when the press is tripped, pilots engage the part on the pressure pad. As the downward stroke continues, the part is formed and sheared off, and two holes are pierced in the stock for the next progressive operation. The work is done in an inclined press, allowing the work to fall off of the die and into a receptacle behind the press.

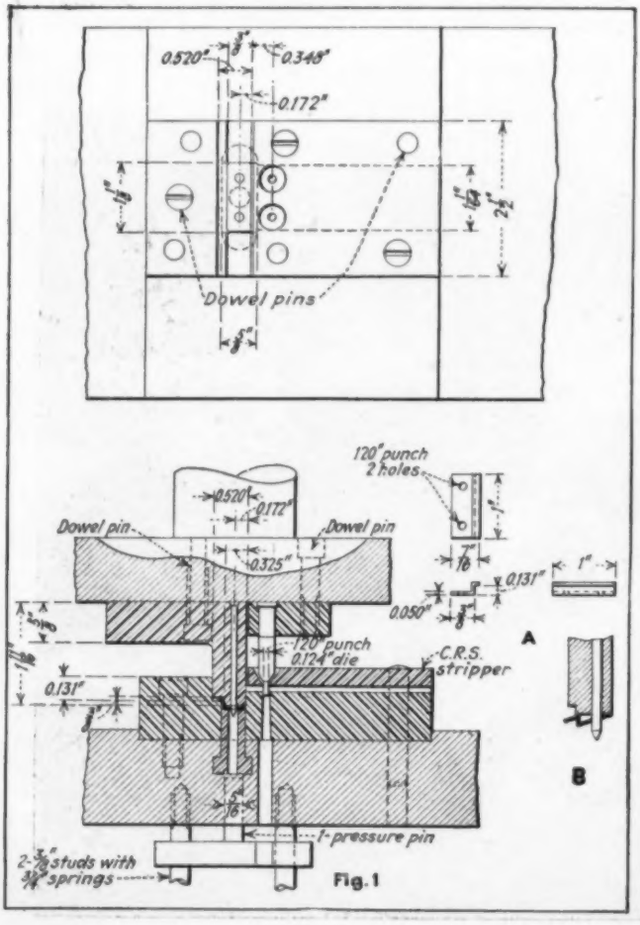


Fig. 1

Pilots for such work should be cone-shaped at the ends, the length of taper being equal to, or a little less than the thickness of the stock. Thus they enter the holes in the stock and pull it to the correct location before the part is cut off. Pilots of such a shape will permit the parts to be easily stripped, otherwise the parts would hang on the pilots, as shown at *B*, making the stripping hard and uncertain.

The part *C*, Fig. 2, is made in the tools shown in that

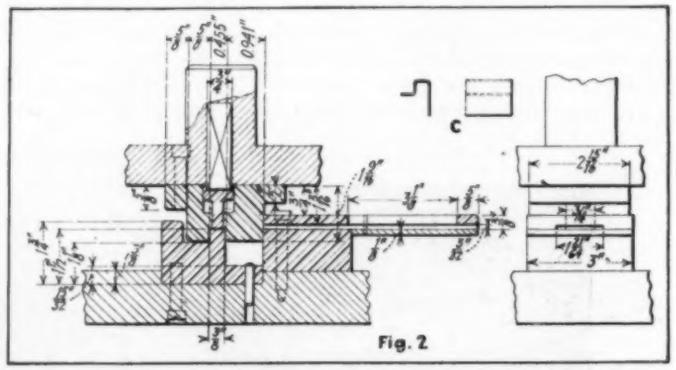


Fig. 2

illustration. There is no waste here, the part being cut off by shearing. After the end of the stock has been squared by shearing, it is advanced to the stop. At the next stroke of the press the blank is sheared and formed. The long stripper plate is to insure that the stock will be fed through straight, and the opening cut through the top of the stripper is for the operator's convenience in following the stock through to the end of the strip. As will be noted, the forming punch enters over the form about $\frac{3}{8}$ in. only, and is equally as effective as if it ironed the stock all the way down, in so far as setting the bend is concerned. Forming dies that iron the total side of the part do no good, since the bend is set by striking the corners.

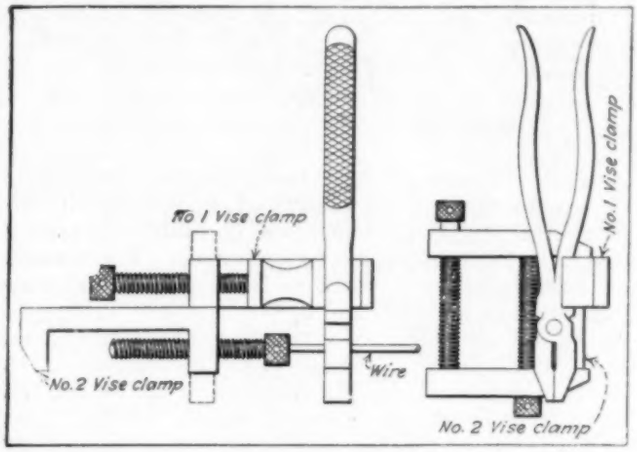
The pressure pad is contained in the punch and prevents the tendency of the stock to draw unequally. Thus all parts are formed identically. In this die the operator has to remove the part, pushing it to the back. The press being inclined, the part then falls into a receptacle at the back. Both tools illustrated are, of course, mounted with guide pins, though they are not shown in the drawings.

Set-Up for Cutting Off Pins

WILLIAM H. MOORE
Hamilton, Ontario, Canada

Having to cut off a quantity of pins from a coil of wire, I looked about for the quickest way to do the work. Finally, I decided to use a combination of clamps and side-cutting pliers, as shown in the illustration. Two vise clamps were held together by a parallel clamp and a pair of side-cutting pliers was held in No. 1 vise clamp. In the plan, the dotted lines represent the parallel clamp.

The head of the screw in No. 2 vise clamp was used



as a stop to control the length of the pins, and could be adjusted for any length of pin within its range. Having assembled the different items, there was nothing to do but push the wire between the jaws of the pliers and against the stop, and cut off a pin by squeezing the plier handles. The entire set-up was simple and certainly resulted in a worthwhile saving.

Removing a Jammed Setscrew
Discussion

C. G. WILLIAMS
Mechanical Engineer

It does not seem possible that removing a broken piston rod from a steam-hammer head, as described by J. T. Towlson (*AM*—Vol. 74, page 256) in his discussion of the article by Stanley Pivonski, under the title given above, (Vol. 73, page 366), actually comes under the head of removing a jammed setscrew; but it evidently does, though far fetched.

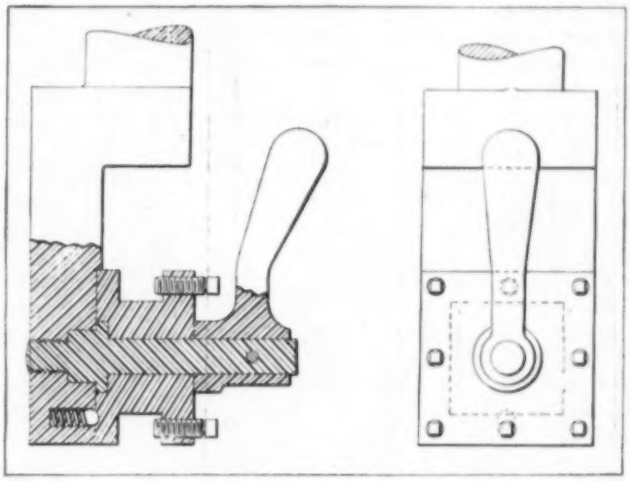
At Hoisington, Kan., in the shops of the Missouri Pacific Ry., a piston rod broke about ½ in. below the top of a steam-hammer head. The head was 11½x16x32 in. The blacksmith tried to get out the piece of rod by heating the hammer head in various ways. At last, the master mechanic ordered a crucible of molten brass poured around the upper part of the head. As the brass failed to expand the head enough to loosen the broken part of the rod, a hole was drilled and tapped in the piece of rod and a 1-in. bolt was screwed in. Again molten brass was poured around the head, and again it failed, as pulling on the bolt did not budge the piece of broken rod.

I then took an oxyacetylene torch and played the flame up and down the sides of the head alternately. As the heating was slow, I called for a man and another torch, so that we could heat both sides of the head at once. Within 30 min. one of the blacksmiths took hold of the bolt and jokingly said, "Watch me pull out the broken piece"; and at the same time he gave the bolt a hard tug. To the surprise of everyone, the piece of rod came out of the head so suddenly that the blacksmith landed on his back and one of his legs was badly bruised where the piece of rod fell on it. Though both science and common sense often-times say "No," still the apparently impossible can be done.

A Turret for the Boring Mill

T. W. AVEN
Superintendent, The Murray Company

In the illustration is shown a turret toolholder for the vertical boring mill. It holds four tools and can be readily indexed to any one of the four positions, so that four different cuts can be made without changing



the tools. It is mounted on the offset and flattened end of a round bar turned to fit the ram of the machine. Four dimples in the under side of the turret, all in the same circle, are progressively engaged by a steel ball backed by a spring. While the ball does not lock the turret when it engages any one of the dimples, it enables the proper position to be located. Locking is done by a turret clamp of the usual type. The use of this device usually eliminates all tool changes during a run of work and thus materially increases production.

Another Use for Compressed Oxygen

A. J. KARLSON
Engineer, Associated Dairy Products Company

Besides being used with other gas for cutting and welding, compressed oxygen can be of great help to the welder in testing the tightness of welds in closed vessels, when neither air nor water under pressure are available.

One end of a high-pressure hose can be fitted to the

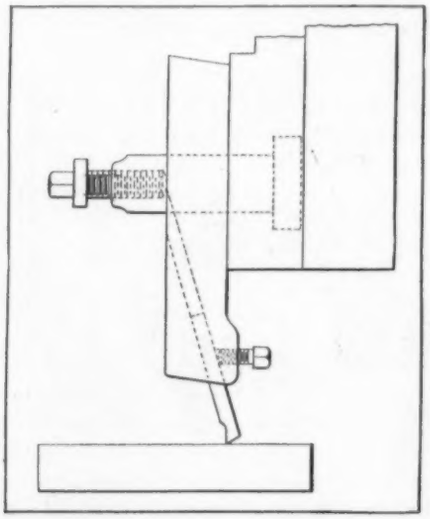
regulator opening on the oxygen tank, the other end being furnished with a large-sized tire valve and its metal tube. The tube should be cut off near the flange and the end threaded with a ¼-in. pipe die. After stopping all openings but one in the vessel to be tested, that opening can be bushed with a pipe bushing tapped for ¼-in. pipe, into which can be screwed the tube containing the tire valve.

Connecting the hose to the tube of the tire valve and to the regulator outlet, the oxygen can be used to test the welds for leaks. To save oxygen, the vessel can be filled with water before admitting the gas, or a tire pump can be used to apply pressure up to its capacity, using the oxygen afterward to build up the pressure to the desired amount.

Cutting Slots in the Shaper

THEODORE KRUGER
Toolroom Foreman, Diamond Machine Company

I have often noticed men cutting slots and keyways in the shaper, using the ordinary toolholder and toolbit. The results have generally been anything but satisfactory. The tool chattered; often it broke and sometimes caused an injury from the flying pieces.

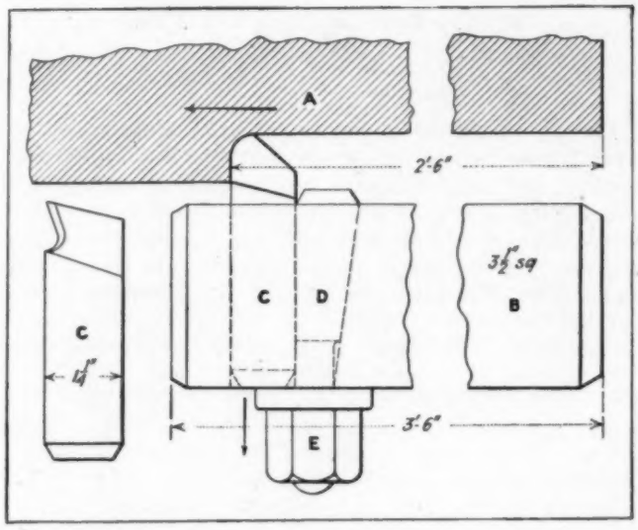


If the toolholder is held in the reverse position from that in which it is generally held, as shown in the sketch, the work can be done better, more quickly, and with little danger of breaking the toolbit. Setting the toolholder in this way brings the point of the toolbit behind the point of support, giving the same effect as that of a goose-neck tool. With the holder held as shown, I have cut slots an inch deep in steel die-shoes with little trouble. A toolholder so held can be used to advantage in trepanning in the lathe.

A Safety Toolbar

J. T. TOWLSON
London, England

In the illustration is shown a safety toolbar that was designed for use in turning large spiders for motors and generators. When such spiders are so large in diameter that the lathe carriage will not pass under them, a particularly long and rigid overhanging toolbar is obviously necessary. In the bar illustrated, one or two innovations have been introduced. The first is that instead of the usual setscrew for gripping the toolbit, a wedge having a threaded shank is employed, the wedge being drawn up by a nut. This substitution has been made because the



hands of the operator have frequently been injured by the usual setscrew being twisted off, or the wrench slipping, in tightening the toolbit, the operator's hand being caught in the horns of the rotating spider. The position of the tightening nut on the wedge eliminates the possibility of such an accident.

The second innovation is, that in removing the toolbit for grinding, or to exchange it for another, it can be drawn out of the bar in the direction of the arrow, and away from dangerous proximity to the rotating work. It will be found that the safety-first officials will accept the safety features of this toolbar as a step toward the elimination of accidents caused by the use of setscrews for tightening toolbits in overhanging bars.

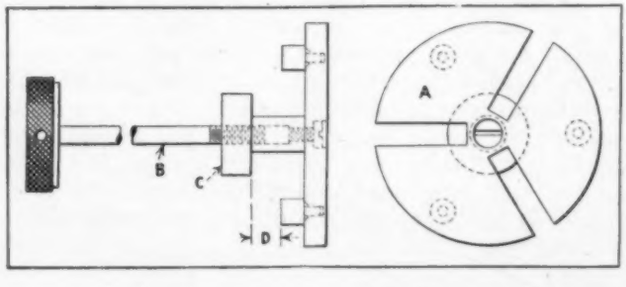
Referring to the illustration; *A* is the work; *B* is the toolbar; *C* is the toolbit; *D* is the wedge; and *E* is the nut for operating the wedge.

Holding Thin Work in the Lathe Chuck
Discussion

MALCOLM K. PARKHURST

In the devices described in articles by Richard H. Kiddle and Donald Raeburn, under the title given above (*AM*—Vol. 74, pages 183 and 876, respectively), no provision is made for supporting the work over its entire surface. When really thin material is worked upon, such a matter is of the utmost importance. Still again, in practically all the devices heretofore submitted, no provision has been made for holding work smaller in diameter than the hole in the chuck.

For many years, I have been interested in the problem of supporting thin stock in the lathe chuck, and offer herewith a device for that purpose. While there is



a certain similarity between my device and the one described by Mr. Raeburn, there are one or two striking exceptions. First, the front of the adapter *A* is at all times free from pins or lugs, the work resting against a smooth surface. Second, the slots in which the chuck jaws slide are carried in to a point below the diameter of the hole in the chuck; in fact as far as they can go without weakening the adapter. Of course, in using any such device, the truth of the face of the chuck should be tested by an indicator. If it is out of true, the remedy is all too obvious.

The adapter is pulled back by the draw-in rod *B* until the pins at the back are in contact with the face of the chuck. The part *C* is a sliding fit in the hole in the spindle and keeps the adapter central. Distance *D* must be such that the part *C* will not interfere with the back side of the chuck jaws. The slip-in pins in the back of the adapter are made in sets of three in different lengths to suit the various thicknesses of the work.

Fixture for Milling Small Clutches

A. E. GRANVILLE

On one of the machines we build there is a small knockout clutch that has its engaging teeth milled on one end. There are only a few of these clutches to be made from time to time, yet they must be interchangeable with any that have been made in the past, or that may be made in the future. For this reason a fixture is advisable if not a real necessity.

"Something simple and inexpensive" was the order to the toolroom, so the fixture shown in the illustrations

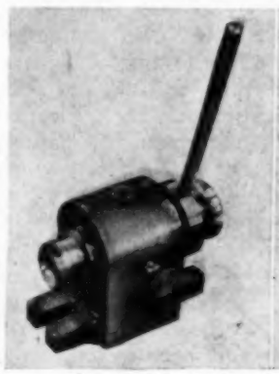


Fig. 1

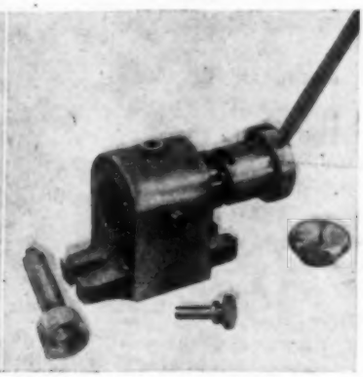


Fig. 2

was made. In Fig. 1 the fixture is shown with a clutch in place, while in Fig. 2 it is shown with all its parts disassembled, so as to give a clear idea of its construction. The clutch blanks are turned in a screw machine, threads being cut on the small ends. These threads make it easy to hold the blanks in the spindle of the fixture by a hand nut, since the heads form shoulders to bear against the front end of the fixture spindle. The two master grooves in the fixture spindle are accurately cut and the spindle is hardened and ground, as is also the guide pin that fits in the grooves. Four holes in the head of the spindle form a capstan for the turning lever. After the two clutch teeth have been milled with a $\frac{1}{4}$-in. end mill, the hooks left are trimmed off with a milling saw, using the same fixture to hold the work, but employing the table screw to feed the work to the saw.

SEEN AND HEARD

JOHN R. GODFREY

Fits and Misfits

Commenting on "Practical Hole Tolerances," John A. Tansley says:

Reading over an article by David W. Ovaitt (AM—Vol. 74, page 316) brought to mind a recollection of the time when mechanics did not use the terms common today. Going back to the year 1900, fits were then classified as running, shrink, press, and drive. The old time machinist did not consider that there was any such thing as tolerance. He did not have the fine measuring instruments, such as are in use today, but did everything with calipers, sometimes using paper when its thickness was known. The swing of the inside calipers in a hole was the gage, and it was seldom that a good mechanic got a misfit.

Speaking of measuring instruments reminds me of an incident that happened in a shop where I worked just before the automoble became a reality. A young fellow came into the shop to work, all fitted out with a fancy tool box, good clothes, a collar, and tie. Nearly all the men in those days wore black shirts, blue overalls, and a blue and white checked blouse. In this particular shop, they did not go in much for cleanliness. The men's trousers were shiny with grease and would just about stand up alone when finally discarded. Consequently the young fellow looked much out of place. Upon inquiry, it was learned that he came from a bicycle factory. The foreman gave him a job on a lathe, and after he had worked a while he asked an Irish helper for a micrometer. "Sure I'll get you one," said the Irishman, and after returning with the most useless C-clamp, he could find, "That's the best we have around here." The new machinist turned the job $\frac{1}{8}$ in. too small. When the foreman asked him why, he said he did not think $\frac{1}{8}$ in. would make any difference in that shop. He quit at noon.

Floating Bushings

Old ideas pop up with amazing frequency and are hailed as new inventions. Floating bushings in locomotive connecting-rod bearings are probably new in that particular place, but they were frequently put in loose pulleys that gave trouble in the old countershaft days. After we had fussed with a hot pulley awhile we took it down, bored out the hub and slipped in a cast-iron floating bushing drilled with a lot of oil holes. Then we could usually forget that pulley. Now railroads are trying perforated floating hub liners between wheels and boxes and find that it helps.

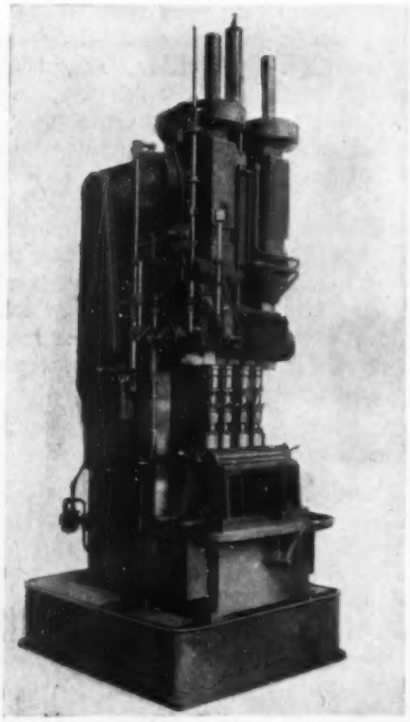
Who Knows Schenck?

A lot of vanished history would be of interest if it could be unearthed. A brass plate bearing the inscription "Woodworth's Patent—Dec. 27, 1828. Made by S. B. Schenck, Mansfield, Mass." was found in an old Russian mill at Sitka. Unfortunately it was nailed to a hand-hewn beam instead of to the machine—evidently a wood planer. Perhaps some old Mansfieldian knows about the Schenck shop where this machine was made!

SHOP EQUIPMENT NEWS

Barnes No. 214, Hydraulic Multiple-Cylinder Honing Machine

Capacity for honing blocks with up to eight cylinders is embodied in the No. 214 hydraulic honing machine announced by the Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill. In honing automobile and gasoline engine blocks that have been reamed uniformly within 0.0015 to 0.003 in. of size, this machine will



remove this stock from all cylinders in less than one minute, and thus production may range up to 100 blocks per hour. The equipment with the machine shown consists of a four-spindle, adjustable-type auxiliary head and tunnel-type workholding fixture. When desired, fixed or adjustable-center auxiliary heads can be supplied for four, six, or eight-cylinder honing. Special fixtures may also be furnished.

The column and base of this machine are of new design, the Oilgear pump being mounted in the column. A filtering system and reservoir for the coolant are also built in the column and base. Dirty coolant is pumped to a filtering tank in the column, clean coolant passing to a reservoir in the base and being delivered to the work. This is done under automatic control; that is, coolant flows when the head is advanced to the honing position and stops when the head is lifted from the block.

The machine clutch lever is arranged so that when pulled forward it engages the driving multiple-disk clutch and opens the hydraulic valve, thus simultaneously starting the rotation of the two spindles and the reciprocation of the head. Backward movement of the lever stops the machine. A latch on the lever permits hand control of the vertical travel of the head without engaging the clutch. Thus, the spindle may be brought to or lifted from the work without rotation. An electrically controlled automatic counting device can be set for any pre-determined number of strokes. More or fewer strokes than the set number can be obtained by means of push-button control.

Each of the two driving spindles drives one-half of the number of auxiliary spindles. On the bottom end of the reciprocating guides is attached the multiple head with its two to eight spindles, according to the requirements of the customer. The hydraulic cylinder permits any vertical travel up to 16 in. Stops on the vertical rotatable rod may be adjusted for any length of stroke within the 16 in. of travel. A skip-stop is provided for lifting the spindle to the uppermost position, thus removing hones from work in all cylinders 10 in. in length and shorter. When the hone has a 4 in. length, cylinders up to 18 in. long may be honed, permitting an over-run of 1 in. at each end of the cylinder.

Specifications: Height to extreme top, 11 ft. 11 in.; distance, center of spindle to face of column, 12¼ in.; maximum distance from top of base to nose of spindle, 50¼ in.; minimum distance from top of base to nose of spindle, 34¼ in.; spindle stroke, 1 to 16 in.; spindle fitted with No. 4 Morse taper; reciprocating speed, 0 to 60 ft. per min.; spindle speed, 200 to 250 r.p.m.; hp., 20 to 25; floor space, 62½x58 in.; net weight, with motor and starter, 10,000 lb.

Stark "Electroblast" Gas-Electric Blowtorch

The Stark Tool Co., Waltham, Mass., has announed a self-contained blowtorch designed for soldering, hardening, forging, melting and light brazing operations. This "Electroblast" burns manufactured, natural or tank gas, the air blast for which is furnished by a built-in $\frac{1}{16}$-hp., universal motor. A temperature of 2,500 deg. F. is developed when firing against a refractory, at a cost of approximately seven cents per hour. The nozzle may be tilted to any required angle and produces a flame which has a wide range of regulation.

The Electroblast is also built with

an aluminum case and pistol grip for hand use. For use with the stand model illustrated, a small heat-treating furnace has been developed. This furnace has a muffle measuring 6x3x2 in. inside, and is so designed that the products of combustion leave the furnace at a point under the door of the muffle, and thus prevent the entrance of oxygen. Using one stand-model Electroblast the furnace reaches a temperature of approximately 1,600 deg. F. in fifteen minutes.

Siewek Improved Fixture Lock

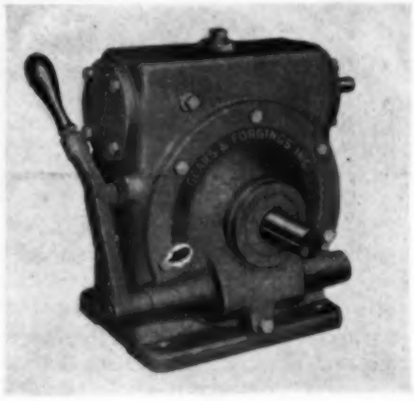
The Siewek Tool Co., 10232 Woodward Ave., Detroit, Mich., has improved its fixture lock so that no housing is required in order to adapt it for use. The housing can be cast on the fixture, making it possible to

bore the housing for the lock and shaft at the same time. The lock can then be applied. This method of applying the lock insures that it will be in alignment with the shaft, and eliminates necessity for doweling. The lock is in closer proximity to the work, making for a more compact arrangement. The cost has been reduced as the housing has been eliminated. The housing can be supplied whenever requested.

Gears and Forgings Two-Speed Worm Gear Speed Reducer

Designed for either horizontal or vertical drives of $\frac{1}{8}$ hp. and up where two speeds are required, a two-speed worm gear reduction unit has been developed by Gears & Forgings, Inc., Cleveland, Ohio. This type of speed reducer is manufactured integral with the motor or as a separate unit in speed reduction ratios ranging from 4:1 to 150:1

The unit consists of a worm and worm gear and a set of differential gears, the driving shafts and Timken roller bearings, inclosed in a leak-proof cast housing. The two speeds are obtained by means of a differential gearing. The high speed is obtained by moving the small hand lever to the right. This locks the differential to the low-speed shaft on which



the worm gear and differential gearing rotate as a unit. Movement of the lever to the left locks the side gear of the differential preventing its rotation. Thus, one-half the speed of the worm gear is imparted to the slow-speed shaft. The change of output speed can be made while the unit is in operation under full load.

Reeves Variable-Speed Motor Pulley

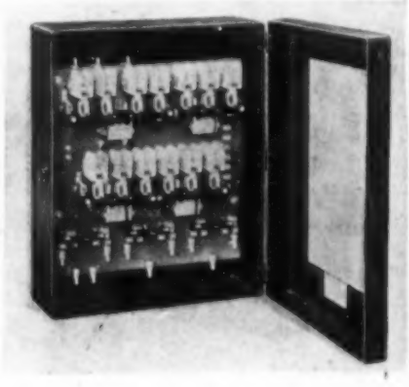
The Reeves Pulley Co., Columbus, Ind., has recently developed a "Vari-Speed" motor pulley, a simple, compact speed-control unit, mounted directly on the motor shaft, and forming the driving element between the motor and the driven shaft. This unit is particularly adaptable to applications on light production machines of limited horsepower requirements. The speed control is infinite over a 3:1 range.

The unit consists of two opposing cone-faced disks, one stationary and one sliding, and an adjustable compression spring, all mounted on the motor shaft, a special motor base with handwheel, and a V-belt, forming connection between the disks and the driven pulley. A turn of the handwheel in one direction moves the motor toward the driven pulley, and in the other direction, away from the pulley. This causes the V-belt to run on a larger or smaller diameter between the disks, the sliding disk moving out laterally. Thus, the speed of the driven pulley is increased or reduced, effecting the speed change desired.

The Vari-Speed motor pulley is built in seven sizes, applicable to any standard a.c. or d.c. motor, and transmits from fractional to $7\frac{1}{2}$ horsepower.

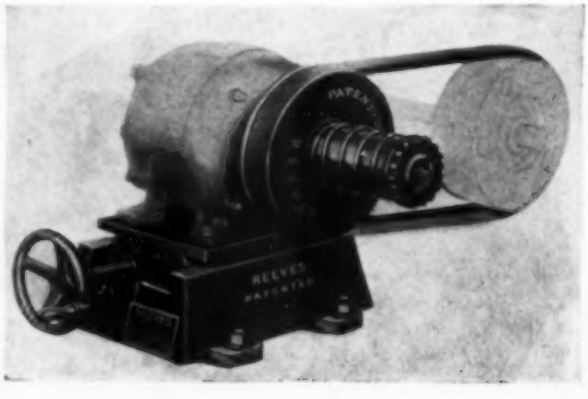
Allen-Bradley Automatic Switches for Multi-Speed Motors

Bulletin 715 automatic, multi-speed, across-the-line switches have been developed by the Allen-Bradley Co., 1311 South First St., Milwaukee, Wis. These switches are for two-, three- or four-speed, non-reversing service, in connection with two- and three-phase, multi-speed



motors of consequent-pole-winding or separate-winding type, in ratings up to 40 hp., 220 volts, and 75 hp., 440-550 volts, 25 to 60 cycles.

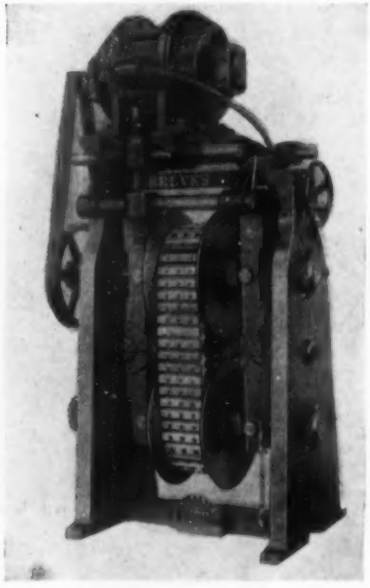
Protection against overloads is provided through the use of thermal overload relays for each speed. No-voltage protection is a standard feature with three-wire control, and no-



voltage release with two-wire control. These switches consist of two or more magnetic switches operated from control stations having 3, 4 or 5 push buttons. A slow-speed-start interlock is an optional feature, which compels the operator to follow a definite sequence in starting the motor.

Reeves Vertical Transmission with Pivoting Motor Base

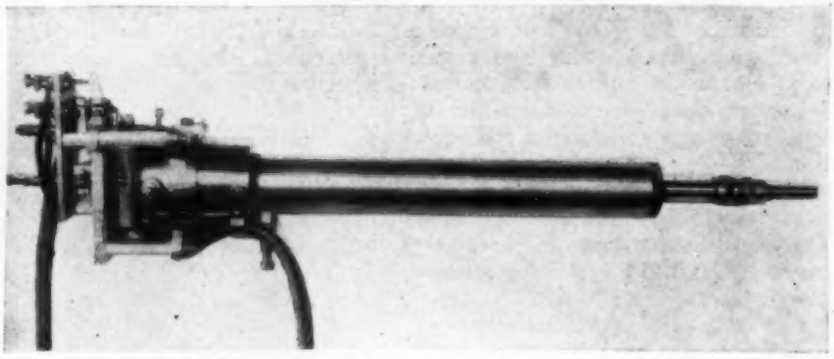
The vertical Reeves transmission, which is built for requirements of limited floor space by the Reeves Pulley Co., Columbus, Ind., is now



available equipped with a motor base which is adjustable vertically, in order that any stretch in the chain or multiple V-belt drive can be taken up. Adjustment is made by a manually operated screw. Lateral adjustment of the motor rails to accommodate different sizes and types of electric motors is also possible.

Combination Tracer for Keller Automatic Toolroom Machines

A combination tracer, which combines the operations of the two electrical tracers ordinarily used on Keller automatic toolroom machines, is now available from the Pratt & Whitney Co., Keller Division, Hartford, Conn. This tracer makes it possible to follow all three dimensions of a model at the same time. It is, for instance, possible to cut a bead in a drawing die punch, the tracer point traveling along the edge of the bead and at the same time following any variation in the depth of the model. Besides a saving in time, the improved method gives a smooth finish and eliminates practically all hand-finishing work.

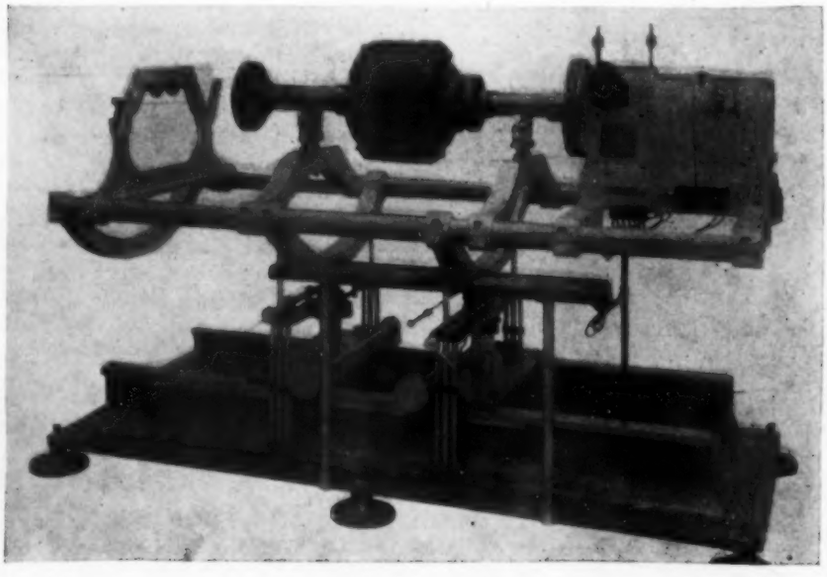


Combination Tracer for Keller Automatic Toolroom Machines

Olsen-Lundgren Style S Electrical Spark, Static Dynamic Balancing Machine

A static-dynamic balancing machine capable of handling rotors weighing from 125 to 1,000 lb., has been developed by the Tinius Olsen Testing Machine Co., 500 North 12th St., Philadelphia, Pa. This style S electric-spark machine is suitable for dynamically balancing Diesel engine crankshafts, electrical armatures, fans, turbine rotors, rolls and other parts. Other standard sizes of this machine will balance rotors weighing from 4 to 15,000 lb.

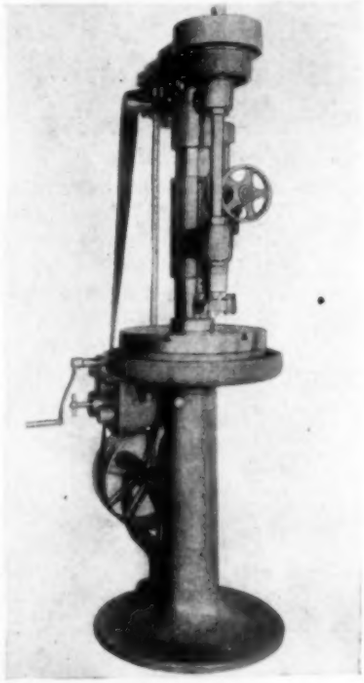
The amount of unbalance in the rotor is determined by adjusting, while the machine is in motion, an artifical unbalance weight until it is exactly equal in amount and opposite to the angle of unbalance in the rotor. Two readings are taken, one at either end, so that a corrective dynamic couple can be applied to the part being balanced. This is supported on rollers attached to a light but stiff vibrating frame. At the right end is located a housing con-



taining an adjustable artifical weight which rotates on the shaft in line with the part being balanced. More details of the principle of operation are found on p. 1021, Vol. 73, on which a smaller machine is described.

Bemis Vertical Continuous Milling Machine

The E. W. Bemis Machine Co., Worcester, Mass., is placing on the market a small continuous milling machine designed to mill small pieces. The machine stands 6 ft. from the



floor and is driven from a countershaft. The work table is 17½ in. in diameter and revolves around the post on ½-in. balls, and is driven by a worm and worm gear at four speeds through means of the gearbox.

The spindle has two speeds, is large, and runs in a tapered bronze bearing. It carries a 5-in. milling cutter. The greatest distance from the cutter to the table is 5⅞ in. In operation, the attendant is required only to load the fixtures.

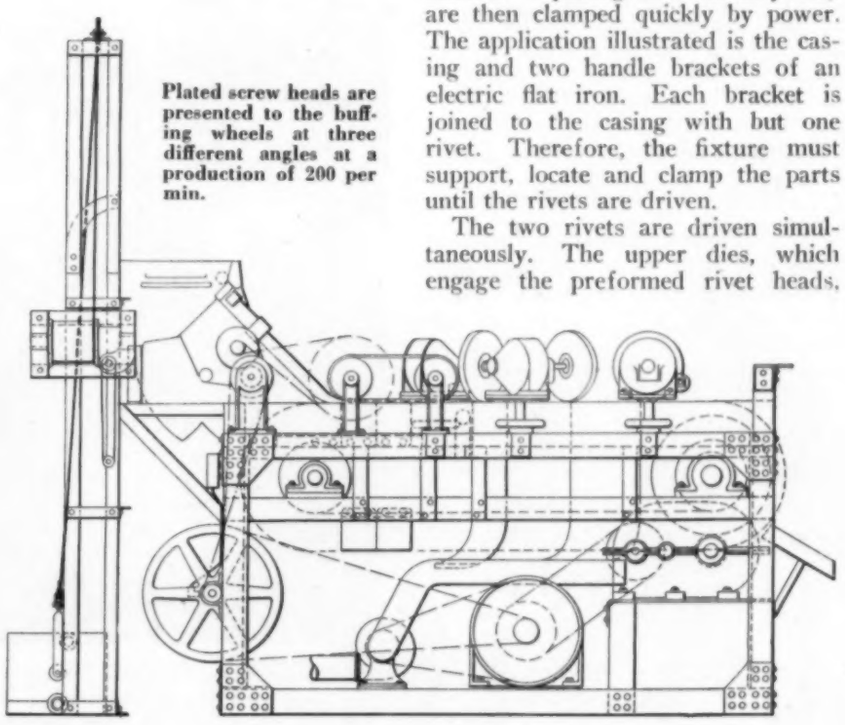
The machine occupies very little space and with suitable holders small pieces can be milled much faster than can be done on a planer. It is designed for either belt drive with bronze bearings or motor driven with ball and Timken roller bearings.

"FAB" Full Automatic Buffing & Polishing Machine for Screws and Bolts

A conveyor-type automatic buffing and polishing machine for screws and bolts has been developed by the Sturt Engineering Corp., 7001 North Clark St., Chicago, Ill. The work is carried to the buffing wheels by means of a power conveyor, and hand buffing is simulated by presenting the work to the buffing wheels at three different angles. First, the screws pass under the buffing wheel diagonally with the wheel revolving against the direction of the screw travel. Second, the screws pass under the second wheel, again diagonally, but the wheel revolves with the screw travel. Third, screws pass straight under the third wheel, the wheel revolving against screw travel. Spring controlled pressure applied to the buffing wheels simulates the pressure achieved in hand buffing.

The machine is designed to feed 200 screws of 1¾ in. length by ¼ in. in diameter to the screw holders per min., and in larger sizes production will be somewhat less. Adjustable slides in the feed hopper and simple adjustments in the feeding mechanism, working groove, operating cam and thrust slides, set the machine for any desired size from a No. 6 to a $2\frac{1}{4} \times \frac{5}{16}$-in. screw.

The screws are dumped into a specially constructed feed hopper, from which they are carried by means of gravity chute to the feeding mechanism, constructed so that an even, constant flow of screws is applied to the working groove. The screws are suspended in this groove by means of the head and are taken by screw holders which carry them "heads up" under the buffing wheels. When the buffing is done the screws are mechanically released and dumped into waiting receptacles. Power consumption is 6 hp. for all motors. The over-all length including the lift loader is 9 ft. 10 in., maximum height to top of lift loader is 8 ft., and the over-all width is 3 ft. 3 in. Approximate weight is 4,000 lb.



Plated screw heads are presented to the buffing wheels at three different angles at a production of 200 per min.

Hanna Vertical Riveting and Assembling Press

A riveting machine particularly suitable for assemblies difficult to fit and hold together by hand has recently been developed by the Hanna Engineering Works, Inc., 1765 Elston Ave., Wicker Park Station, Chicago, Ill. In addition to driving rivets, this machine functions as an assembly fixture. The parts can be placed into it progressively in a manner requiring no dexterity and are then clamped quickly by power. The application illustrated is the casing and two handle brackets of an electric flat iron. Each bracket is joined to the casing with but one rivet. Therefore, the fixture must support, locate and clamp the parts until the rivets are driven.

The two rivets are driven simultaneously. The upper dies, which engage the preformed rivet heads,

Hanna Riveting and Assembling Machine set up for flat iron handle pieces

float laterally sufficiently to compensate for the eccentricity frequently existing between the preformed head and the shank of the rivet. This is essential as the rivet holes are very accurately located relative to the driving die axis and the plating of the parts and rivet heads must not be marred. The fixture is opened by foot and the riveter operating valve is also foot actuated. Consequently, the operator's hands are free to load and unload the fixture.

Bethadur Corrosion and Heat-Resisting Steels

Nine different grades of Bethadur corrosion and heat-resisting steels are manufactured by the Bethlehem Steel Co., Bethlehem, Pa. In conjunction with Bethalon free-cutting steels marketed for some time, these steels give a complete line of corrosion-resisting steels.

Typical analyses of these nine steels are as follows:

Bethadur	C	Mn.	Ni.	Cr.	Si.
1	.11	.30	.....	12.50	...
2	.13	.30	8.00	18.00	...
3	.30	.30	19.00	8.00	...
4	.11	.30	.....	17.00	...
5	.11	.30	.....	21.00	...
6	.40	.30	.....	14.00	.25
7	.65	.30	.....	17.00	...
8	1.15	.30	.....	18.00	...
9	.30	.30	.....	28.00	...

Bethadur No. 1 is of the standard corrosion-resisting iron type. The No. 4 is similar to No. 1 in that it requires no heat-treatment to bring out the maximum amount of heat-resisting properties, but due to the increased chromium content it does not respond appreciably to any form of heat-treatment. This steel is suitable for applications where high resistance to atmospheric attack is required but where maximum physical properties are relatively unimportant. The properties of the No. 5 are much the same as for the No. 4, except that the corrosion and heat-resisting properties are increased in proportion to the increased chromium.

Bethadur No. 2 is the 18-8 composition, which is well known. Bethadur No. 3 is primarily an acid-resisting steel. Nos. 6 to 9 inclusive have increasing amounts of carbon and also of chromium to increase the hardness and corrosion-resistance. No. 6 is a non-rusting cutlery steel. No. 7 is designed for combination of hardness, resistance to corrosion and abrasion. Bethadur No. 8 is similar to No. 7 except the hardness is greater, maximum hardness of Rockwell C-60 being obtained. Bethadur No. 9 is especially intended for parts subjected to high temperature.

"Hyro" Improved Automatic Cyanide Hardening Furnace

Several improvements have been made in the "Hyro" cyanide hardening furnace built by the Parker-Kalon Corp., 200 Varick St., New York, N. Y. Fig. 1 shows an automatic preheating and loading attachment at the left-hand side of one of these furnaces. Exhaust heat is concentrated against the bottom of the loading fixture, thereby warming up the work and drying off all moisture before it is emptied into the cyanide basket. This loading fixture pivots on the shaft and allows the charging of the furnace with both work and cyanide without opening the doors. A damper arrangement in the exhaust flue can be set to entrain the heat either against the loading attachment or send it out through the exhaust system.

Another improvement, not illus-

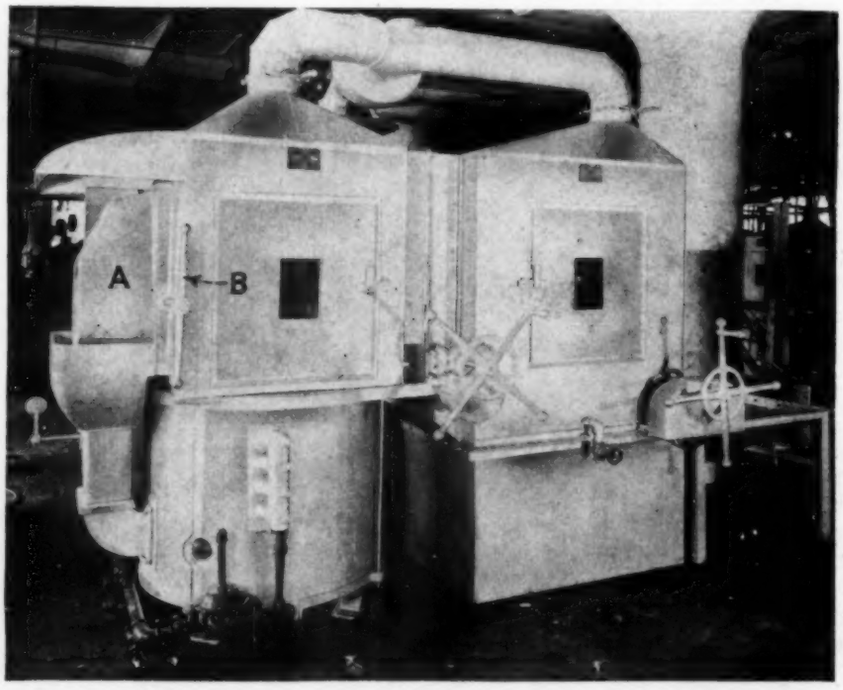


Fig. 1—Hyro Cyanide Hardening Furnace equipped with an automatic preheating and loading attachment at the left-hand side at A, and operated by the dumping lever B

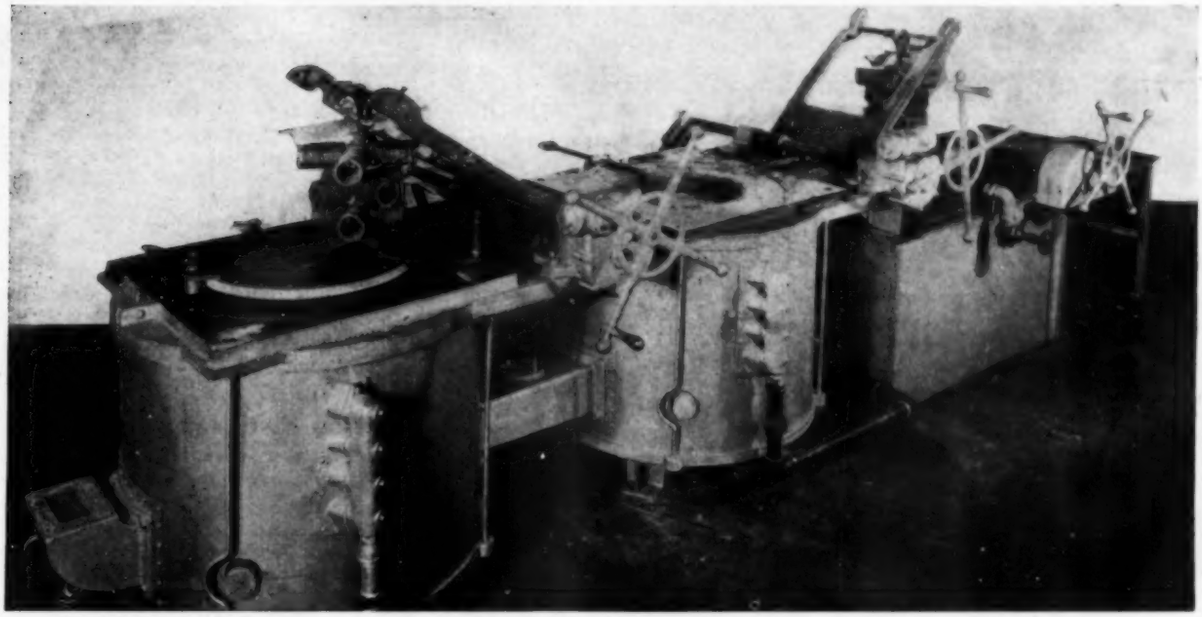


Fig. 2—Hoods removed from a Hyro hardening furnace fitted up for rack work. The first section is for preheating, the second for cyanide hardening and the third for quenching

trated, is an angle thermocouple which gives the correct temperature of the bath at all times and has the advantage over the former arrangement in that it remains in the bath. Automatic control of the furnace can be had through this arrangement.

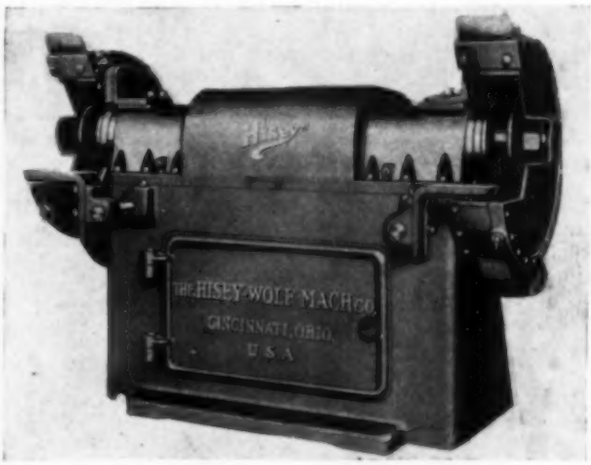
Fig. 2 shows a three-compartment equipment with the hoods removed. This is a convertible basket- and rack-type furnace. The center furnace is for heating up cyanide, and waste heat is trapped through a refractory-lined tunnel to the preheating furnace at the left-hand side, in which a circular baffle plate has been installed, preventing the heat and flames from touching the work. Enough heat is secured in this manner to dry the work thoroughly before it is put into the cyanide. In some cases, it is necessary to apply additional heat, and this is done by means of burners arranged in two sets of four each, so that one or two sets may be lighted as required.

In Fig. 2 the basket and basket plates have been removed and made ready for the use of fixture work. In this case the work consists of round rings that are evenly spaced and suspended from the alloy fixture. One set of rings is never directly over the other, and thus allows for better and more uniform hardening. The fixture is hung from hooks which automatically pick it up at one station and release it at the next station. The photograph shows a batch of work before it is put into the preheater and also another batch that is being brought from the cyanide pot to the quench tank. After a load has been deposited in the preheating furnace, it is covered by a swinging asbestos lined plate to conserve heat. It takes but a few minutes to change this furnace over so that it may be used either for basket work or for racked work.

"Hisey" Heavy-Duty Snagging Grinder

Independent speed control for each wheel is a feature of the heavy-duty snagging grinder developed by the Hisey-Wolf Machine Co., Cincinnati, Ohio. On previous machines with wheels on both ends of the spindle, the speed of both was determined by the size of the larger wheel, thereby causing the smaller to run slow.

This machine is manufactured for 20-, 24-, and 30-in. grinding wheels, either high-speed or vitrified, with spindle speeds to correspond. Ball bearings or Timken roller bearings are optional equipment. The drive is through V-belts and any stock motor can be used. Automatic belt tension adjustment is provided.



"Leadhesion" Coating Process

A permanently adhering lead coating of any desired thickness can be put on metal surfaces as a protection against corrosion by means of the "Leadhesion" process, developed by the Gross Engineering Corp., 3955 West 25th St., Cleveland, Ohio. This process can be used in the field as well as in regular shop work, and is particularly suitable for chemical, papermaking, oil-refining equipment.

TRADE PUBLICATIONS

BEARINGS, THRUST. The Kingsbury Machine Works, Inc., Frankford, Philadelphia, Pa., has issued Bulletin HV to supersede Bulletins D, F and parts of G, and combines in one booklet descriptions of vertical and horizontal thrust bearings, which are to a large extent interchangeable in their parts. Only standard self-aligning thrust bearings are covered. Capacities, weights and principal dimensions are given, together with a variety of standard mountings available.

CHUCKS. The Union Mfg. Co., New Britain, Conn., has issued a folder on the electrical-operated chuck recently described in these pages.

FRICTION BLOCKS. The Johns-Manville Corp., 292 Madison Ave., New York, N. Y., has issued a performance report on its friction blocks, No. 43, series FR-3, entitled "A Report of Performance of Johns-Manville Asbesto-Metallic Friction Blocks on Power Transmission Machinery as used by T. B. Wood's Sons Co., Chambersburg, Pa." It gives performance data as against other friction materials and the annual savings as concerned with a particular job.

FLOOR PLATE. The Inland Steel Co., First National Bank Bldg., Chicago, Ill., has issued a folder on 4-way floor plate that is non-skid in all directions.

INDUSTRIAL CARS. The American Car & Foundry Co., 30 Church St., New York, N. Y., has published Bulletin No. 102, superseding 101, concerning industrial cars for industrial railways. The essential data are given, together with many illustrations of typical types produced.

IRON SHEETS. The Republic Steel Corp., Youngstown, Ohio, has just issued a 64-page booklet entitled "The Path to Permanence," giving latest information on Toncan copper-molybdenum iron sheets. It also gives a great many illustrations of various applications of this rust and corrosion-resisting sheet metal.

JIG BORERS. The R. Y. Ferner Co., Investment Bldg., Washington, D. C., has issued a 32-page pamphlet entitled "Performance Data," showing numerous illustrations of jigs, fixtures, dies, molds and special parts that have been drilled and bored on various Société Genevoise jig boring machines as used in the United States, and giving performance data.

MECHANICAL CATALOG. The American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y., has published the 1931-32 edition of its annual "Mechanical Catalog with Directory of Manufacturers of Industrial Equipment, Materials and Supplies." Products of 488 manufacturers are included, arranged for ease of reference. The catalog contains 990, 11¼ x 9¼-in. pages, bound in limp artificial leather.

MULTI-SPEED DRIVE. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued Leaflet L20520 on the Westinghouse-Wise multi-speed drive, which consists of an adjustable speed reducer built into a standard induction motor.

WESTINGHOUSE RESEARCH. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has published a very attractive booklet entitled "Stories of Westinghouse Research," which illustrates and describes briefly the many lines of endeavor in which the company scientists have pioneered.

PATENTS

OCTOBER 13, 1931

Metal-Working Machinery

Apparatus for Soldering. Arthur H. Adams, New York, N. Y., assigned to Western Electric Co. Patent 1,826,710.

Tumbling Mill. Nathan Ransohoff, Cincinnati, Ohio. Patent 1,826,822.

Multiple Spindle Machine. David F. Domizi, Cleveland, Ohio. Patent 1,826,867.

Anchoring Means For Portable Tool Supports. John Jensen, Rockford, Ill., assigned to Whitney Metal Tool Co. Patent 1,826,937.

Molding Apparatus. Hobart J. McKay, Paul J. Carlsen, and Alvin O. Fuhrman, St. Paul, and Edwin Unzel, Minneapolis, Minn., assigned to American Container Corporation. Patent 1,826,945.

Screw And Similar Machine. Charles A. Rich, Providence, R. I., assigned to Brown & Sharpe Mfg. Co. Patent 1,826,953.

Threading Apparatus. Robert Hofstetter, Downers Grove, Ill., assigned to Western Electric Co. Patent 1,827,198.

Arc Welding. James F. Lincoln, East Cleveland, and Cecil C. Peck, Cleveland, Ohio, assigned to The Lincoln Electric Co. Patent 1,827,245.

Depth Cut Indicator. Anton Schmid, Huntington, W. Va., assigned to Herbert Lang, James Yerkeson, and Grant Yerkeson. Patent 1,827,265.

Grinding Wheel Guard. George E. Smith, Covington, Ky., assigned to The United States Electrical Tool Co. Patent 1,827,270.

Multiple Spindle Metal Turning Machine. James C. Potter, Pawtucket, R. I. Patent 1,827,485.

Attachment to Embossing or Stamping Machine. Frank Williams, New York, assigned to Simplex Gold Stamping Press Co. Patent 1,827,550.

Press. Arthur A. Byerlein, Detroit, Mich, assigned to General Machinery Corporation. Patent 1,827,558.

Spring Handling Machine. William S. Bullock, Chicago, Ill. Patent 1,827,561.

Electric Hammer. James E. Bryan, Seattle, Wash. Patent 1,827,611.

Stamping Machine. George F. Yager, Toledo, Ohio, assigned to the Bunting Brass & Bronze Co. Patent 1,827,683.

Tools and Attachments

Tool Set and Container Therefor. William F. Costello, New Britain, Conn., assigned to the New Britain Machine Co. Patent 1,826,739.

Sine Bar Fixture. Hans J. Lovenston, Detroit, Mich. Patent 1,826,802.

Gauge. (Steel-Beam Layout). Abram J. McDanel, New Brighton, Pa. Patent 1,826,807.

Device for Use in Forming Undercut Sections of Rolled Metal. Hermann Oberschulte, Essen-on-the-Ruhr, Germany. Patent 1,826,813.

Apparatus for Gauging and Adjusting Articles. Arthur William Schoof, Riverside, Ill., assigned to Western Electric Co. Patent 1,826,828.

Grinding Wheel. George E. Vance, Springfield, Ohio, assigned to the Safety Grinding Wheel & Machine Co. Patent 1,826,907.

Electric Soldering Iron. Raymond R. Hazlett and William J. Alexander, Linden, N. J. Patent 1,826,933.

Driver for Wheel Lathes. Ernst Blau, Berlin, Germany. Patent 1,827,136.

Chuck. (Wheel). George J. Evelo, Terre Haute, Ind., assigned to American Car & Foundry Co. Patent 1,827,387.

Chuck. Clarence G. Bidwell, Bristol, Conn., assigned to the Fafnir Bearing Co. Patent 1,827,415.

Spring Cushion for Presses. Fredrich J. Rode, Chicago, Ill., assigned to Marquette Tool & Mfg. Co. Patent 1,827,440.

Attachment for Pneumatic Hammers. Juan Galaz, Los Angeles, Calif. Patent 1,827,647.

Device for Surfacing Grindstones. Karl Jung, Berlin, Germany. Patent 1,827,659.

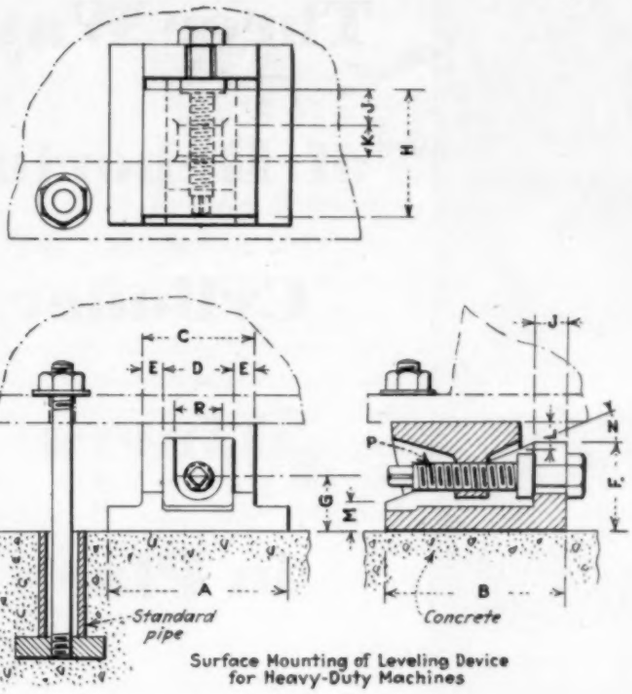
Furnaces

Tempering Furnace. Walter Grothe, San Leandro, Calif., assigned to Caterpillar Tractor Co. Patent 1,827,194.

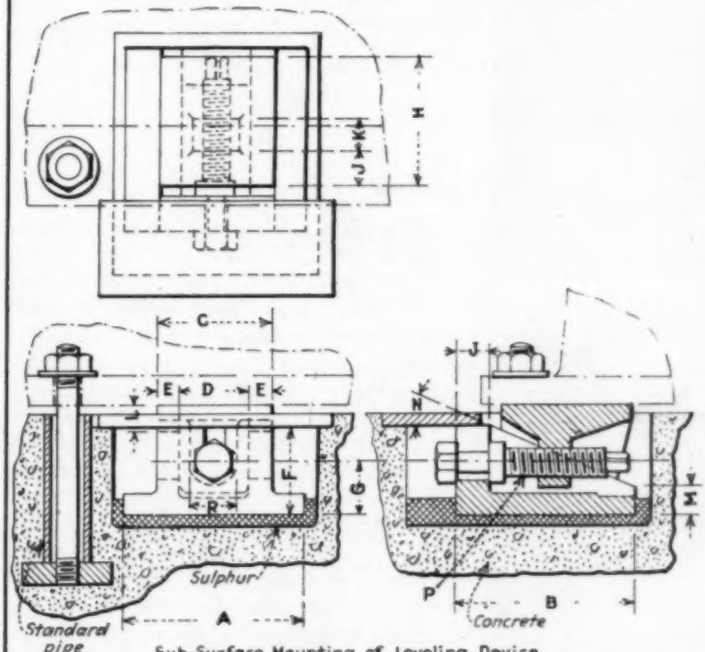
Vertical Chamber Oven. Carl Otto, Hellerup, Denmark. Patent 1,827,328.

Electric Oven. George W. Heinbuch, Toronto, Ontario, Canada, assigned to General Electric Co. Patent 1,827,656.

MACHINE TOOL FOUNDATIONS AND LEVELING DEVICES

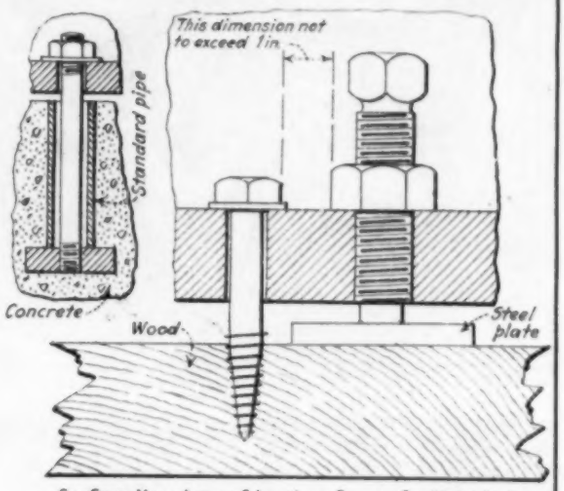


Surface Mounting of Leveling Device for Heavy-Duty Machines



Sub-Surface Mounting of Leveling Device for Heavy-Duty Machines

No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
1	6	7½	4½	3	¾	3	2	5½	¼	1½	1 in.	⅞	18°-46'	1-8 Thread	2½
2	6	10	4½	3	¾	4	2	7	1½	1¾	1¼	1⅛	18°-46'	1-8 Thread	2½



Surface Mounting of Leveling Device for Light-Duty Machines on either Wood or Concrete Floors

THE process of wedging, shimming, and grouting of machine tools has long been considered an inflexible, hence unsatisfactory, method of installation. Some machine tool builders have already elected to change, but no comprehensive effort at standardization has been made until recently. Westinghouse Electric & Manufacturing Co., East Pittsburgh, through J. R. Weaver, superintendent of the manufacturing equipment department, after consultation with some 24 tool builders, with the editors of *American Machinist*, and with the National Machine Tool Builders' Association, evolved this illustrated series of standard foundations and leveling devices for its own use. Examination showed grouting to be unnecessary and undesirable, so its use has been discontinued.

Now when a new tool is ordered, the tool supervisor, plant layout department, and the equipment suppliers are consulted to determine which type of leveling device is applicable, so that the information can be written in the contract and made part of the equipment order. Usual procedure is for the builder to supply wedges or leveling screws, the buyer supplying foundation bolts and plates.

The method of leveling shown above seems comparatively new, while those at left have been used by some tool builders for a number of years for those installations requiring a foundation. The leveling wedge is so constructed that it does not protrude beyond the flange of the machine bed. A wood or metal cover hides the wedges in above-surface installations. For the sake of flexibility, studs and lagscrews are used for fastenings instead of the conventional bolts.

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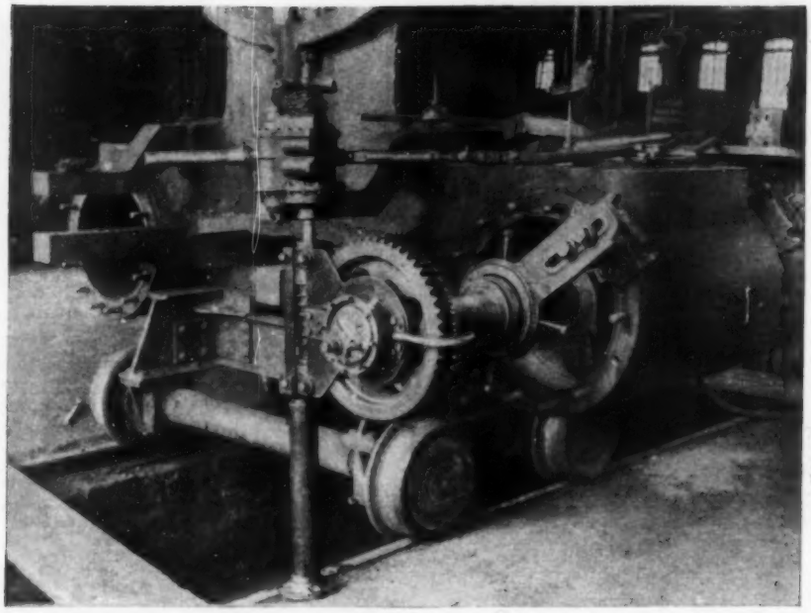

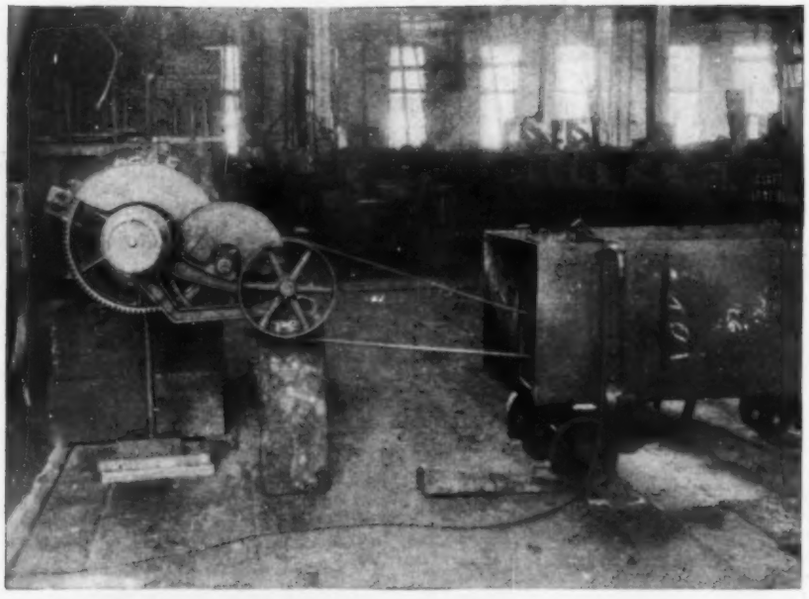

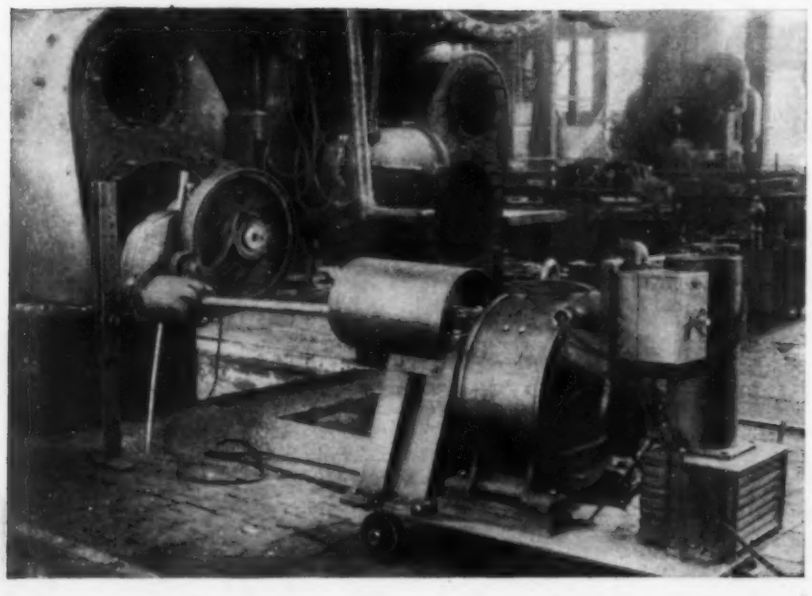

Three Ways of Reboring Cylinder Liners in Place

DEVICES for reboring cylinder liners in place are legion, some commercial, others homemade. No two are alike, and there is just as wide diversity between the methods of supplying power to drive them. Here are three representative samples from widely scattered sources—one powered by air, two by electricity. The air motor and worm drive form a compact and neat arrangement in the first unit illustrated, being used in the C.S.P.M. & O. shops. In the next, the same buggy that holds the electric driving motor has space for the boring rig and facilitates its transportation between jobs. It is used by the Missouri Pacific in the Little Rock (Ark.) shops. The last, used by Union Pacific in its Omaha shops, conserves floor space by employing a direct drive through a universal-jointed shaft instead of a belt drive. A joint protector is incorporated.

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, October 22, 1931

VOL. 75 NO. 17

Thomas A. Edison

Early in the morning of October 18, the greatest, most beneficent and most prolific inventor in the world passed away at his home. Instantly the instruments he pioneered were rushed into service to fill the wires and ether with heartfelt tributes from men of every station in life. While the world had known in its heart that his going was but a question of time, no prophet could have foreseen the immensity and profundity of its emotion.

Measured in money values, it has been estimated that his work contributed over fifteen billion dollars to the world's wealth; measured in human values, his life contributed far more. To an age whose proudest boast is its hard-boiled realism, Thomas A. Edison's life proved that genuine realism and the kindliest basic human virtues are not incompatible.

Getting Ready to Use Tungsten Carbide

During the dull period which has existed in almost all metal-working plants for many months it has been difficult for tungsten carbide and other "super" cutting materials to account for savings that would justify large expenditures for them. Curtailed runs, the hesitancy of many managers to go far toward replacing men by machines during this period, and other allied difficulties have been responsible.

In many progressive plants, however, much experimental work with these new materials has been done. The object is to insure that the men who will do the stepping up of production that is apparently just ahead of us, shall know how to handle the carbide tools to the best advantage.

The superintendent of one shop tells of instructing one of his men to apply a carbide tool to a job on which he was engaged. After a perfunctory trial the man reported that it would not work. Somewhat to his surprise, he was told that it was his responsibility to make it work. Needless to say he found a way to do so.

One effect of this experimental work is going to be the showing up of the inability of the older machine tools to stand up to carbide tools. Many of them will be added to the obsolete lists that handicap so many shops. And when replacement starts there may well be a stampede because not very many equipment builders have inventories of any size.

Wage Reductions

Announcements of wage reductions by large and small corporations are becoming somewhat prevalent in the news columns of the daily papers. Following similar action in the steel industry, General Motors publishes a ten per cent reduction in salaries under $3,000 and graduated upwards for the higher brackets till at $50,000 and above, the reduction is twenty per cent.

Acts of this nature are bound to call forth criticism and accusations of bad faith with a sorely pressed government imbued with a spirit and a determination to prevent reduction of the American standard of living. Yet it is clearly evident that the standard of living of those of our people who have been unemployed during the past two years has been markedly reduced, and promises to continue in this depressed condition for some months to come. To maintain then that wages shall not be reduced at present is in a sense maintaining that those who have jobs shall not have their superior advantage reduced—superior not only in having a job, but in the larger real income which present wages will buy.

In this depression, as in previous ones, one of the disturbing factors is that not all prices fall in the same degree. Owners of fixed obligations of business and industry, if their securities have not become almost valueless due to a failure of the

obligators to earn profits, are in an advantageous position. Yet, due to the safeguards set up to protect the sanctity of contracts, it is impossible to reduce their claims.

Normally, those who supply the capital that business and industry need to operate and expand, demand safety and a return upon their savings which they entrust to management. Since, in our present industrial set-up, the ability to earn profits is the only effective measure we have of whether our resources in materials and man power are used effectively from the social point of view, it is not a complete solution to advocate that they should absorb the burden. Indeed, many of our stronger corporations are not now earning profits but are incurring losses. It is true also that in many cases improvements in industrial processes are not now being made because management does not wish to add to the burden of unemployment.

It seems then that the part of wisdom is to desist quixotically charging windmills, and to accept a condition, disagreeable though it may be, roll sleeves up above the elbow and help get industry and business back where we like to think it belongs.

◂◂ CHIPS ▸▸

Though his going has been expected for many anxious days, it is hard to adjust ourselves to the thought that Thomas A. Edison will no longer be signing that illustrious name in his characteristic and characterful handwriting. To the last we hoped that he would confound the ghoulish newspapers by a recovery as miraculous as his life. While the world bowed in remembrance and reverence, and within a few moments of dictating a tribute to his old friend, Dr. Samuel W. Stratton, chairman of the Massachusetts Institute of Technology and founder of the U. S. Bureau of Standards, died. The loss of two such men is irreparable.

While Edison lay dying, event trod on the heels of event . . . Paramount is the completion of the organization of the National Credit Corporation with resources of over a billion dollars assured . . . George M. Reynolds, Chicago banker takes the chair; Mortimer N. Buckner, New York banker, the presidency . . . Though inexpert publicity and unnecessary delay have conspired to becloud the potentialities of President Hoover's banking plan, it is bound to add good round dollars to the pockets of every man in the metal-working industry . . . Meanwhile the Department of Justice proposes reforms in the national bankruptcy laws . . . Hoover seeks to cut 300,000,000 dollars out of the budget . . . good news for taxpayers, but hard on government employees . . . American Engineering Council initiates mobilization of 100,000 engineers for unemployment relief . . . American Federation of Labor goes to Canada to demand American reforms and expenditures too numerous to list.

> "In this country, for a hundred years, we had a system where employers guaranteed shelter, food and work . . . We called it slavery."
> —Victor Orlander.

Perhaps we shall have to wait for Premier Laval to decipher the European situation . . . Savors too much of comic opera and melodrama to be convincing . . . Bruening is out, Bruening is in, in Germany . . . France worries because she has too much gold; she buys more in New York . . . Reduced doles are going to bring revolution to the British Isles; they go into effect with one small communistic ruction in Cardiff . . . But the Bank for International Settlements renews the German credit . . . And Stimson seems to understand the situation so well that he permits the United States to forego traditional isolation and to occupy a seat at the table of the League of Nations . . . Thus far, the net result of recent U. S. participation in European affairs seems to be a 92,000,000 dollar trade balance for Germany . . . an all-time high . . . Strange that we cannot give credit to Russia, but bankrupt Germany can . . . Machinery and machine tool builders could use some of that business, right now.

> Employees of the William Penn Hotel in Pittsburgh were somewhat alarmed at the attention given by the semi-annual meeting of the American Gear Manufacturers Association to the subject of "Tip Relief."

At that, America shows a September trade balance of 10,000,000 dollars . . . something after all . . . Freight loadings go up 39,808 cars for the week . . . a new high for the year . . . American Tel and Tel reports net gain of 12,000 telephones for first nine months of 1931 . . . Philadelphia metal-manufacturing employment gains twelve per cent since July . . . United Air Lines business increases . . . 31,250,000 pairs

of shoes are manufactured in August, against 28,428,000 last year . . . Auburn earns 4.91 in third quarter; 0.90, third quarter 1931 . . . Nash up also . . . Nineteen cities report tangible gains in business and employment, including Boston, Buffalo, Philadelphia, Atlanta, Detroit, St. Louis, Kansas City, and Seattle . . .

Cornell University celebrates the sixtieth anniversary of the completion of her first building devoted to engineering . . . New York City awards subway contracts totalling over $14,000,000 . . . $10,000,000 for cars to American Car and Foundry; $2,400,000 for motors to General Electric; $1,230,000 for electrical equipment to Westinghouse Electric & Manufacturing . . . Nash is taking Milwaukee operations to Kenosha . . . The Austin Company is building two additions for Boeing Airplane Company.

TAKE YOUR CHOICE

As reported by official Washington agencies, we beg leave to record employment conditions in August: August brought a noticeable improvement in employment and industrial activity—*President's Organization for Unemployment Relief;* There was little change in industrial employment situations during August—*U. S. Employment Service;* There has been a decrease of 12.4 per cent in factory employment in August and a 20 per cent cut in the payrolls—*U. S. Bureau of Labor Statistics.*

THIS WEEK IN *A.M.*

Last week we suggested that "Preferred Numbers for Standardization" would be taken up this week. But in the meantime, Ralph E. Flanders, manager of the Jones and Lamson Machine Tool Company, made an address at the Machine Tool Builders Association fall meeting. Things began to happen. October 14, K. H. Condit wired us from Chicago that the manuscript of the address was being mailed by special delivery, that space must be reserved for it. Through some unexplained breakdown in Uncle Sam's mail service, it did not arrive until 4:45 P.M., October 16, but you have it on page 627 under the title, "Industry's Responsibility in this Depression." You will agree that Mr. Flanders has again made a notable contribution to clear industrial and economic thinking.

Oliver P. Van Steewen begins his promised series, "Precision Measuring Instruments" (page 619). No American manufacturer should fail to check the German practices he describes against his own, and here is an excellent opportunity.

Nor is C. W. Hinman, author of "A Cutting-Off Punch and Die" (page 631), a stranger. Formerly chief tool designer of The Addressograph Company, he now occupies the same position with Kobzy Tool Company. He has given you the benefits of his best thought and experience times almost without number. Those who work in heavy stock will best appreciate the present contribution.

Very shortly after Plymouth began to sweep the low-priced automotive field, we got into touch with A. P. Gwiazdowski, assistant professor of shop practice, University of Michigan. Recalling his excellent comparison of piston machining practice, we asked him if he could spare the time to visit the Plymouth plant and report his findings. He could and did, as evidenced by "Plymouth Machining Methods" (page 632). Maurice Taylor, author of "Arc-Welding in Japan" (page 638), has just returned from a two month visit to that country. He is welding technician for The Lincoln Electric Company. In view of the Sino-Japanese ruction, his contribution is most timely.

COMING

Almost any machine tool builder or salesman can cite instance after instance where plant executives need new equipment and need it badly, yet their boards of directors will not authorize the essential expenditures. One plant executive refused to allow his board to stand in the way of his and their plant's prosperity. He prepared an exhibit which showed graphically what each new machine meant to the company's program. He got his machines. The whole story will appear as the leading article in next week's issue.

With it will come an article describing Lincoln stamping practice, the second installment of "Precision Measuring Instruments," plus a page of brand new American inventions in gaging. And the Russian situation will be seen through a pair of European eyes in "American Engineers vs. Russian Shrewdness."

For the issue of November 5, we have two strong contributions on advanced die practice, an excellent one on the generation of worm gears, and the postponed "Preferred Numbers for Standardization." November 12, appear the winners of the *American Machinist* Awards for 1931, together with the two winning briefs in full.

THE . INDUSTRY .

Progress in Metal-Working and Machinery Markets

OCCASIONAL single-item sales and scattered inquiries temper the long drought in machinery and machine tool markets. . . . Milwaukee and Detroit expect October to better September in sales; other districts are not so sure. . . . Chances for business in any quantity in the immediate future are dependent upon financial encouragement and bettered general business; if anything, more dependent than previously. . . . Used tools are going poorly, even at give-away prices. . . . N.M.T.B.A. indexes declined for September, 3-month average gross orders dropping to 63.1 from 68.9 because of a gross order index of 56. . . . Class B ($10,000-$50,000 shipments average 1922-24) plants bettered their index, others declined. . . . Shipments and unfilled orders dropped.

NEW YORK sold a jig borer and some incidental tools, and reports sales of two milling machines and other single units to Lycoming. . . . General inquiry remains quiet, but dealers are recurrently hopeful. . . . Cleveland awaits lists from the new Addressograph-Multigraph, General Electric Lamp, Peerless, and Hupp plants, with other trade negligible. . . . Philadelphia has a few orders, and some betterments over September. . . . Detroit is encouraged with continuing automotive and die shop activity, though tool sales are few. . . . Milwaukee likewise expects much from automotive sources, and something from Government, electric railway, tractor and farm implement lines.

NEW ENGLAND has Government orders and some possibilities in electrical appliance and clock factories. . . . Foreign business is discouraging. . . . Chicago has an occasional word of cheer and a list of general tools from the Great Northern. . . . Buffalo has nothing but prospects, and most of them governmental. . . . Cincinnati manufacturers continue to get small orders, and dealers there get an occasional tool. . . . The greater proportion of orders in all sections are governmental.

NEW YORK

Two milling machines and some unnamed additional tools to Lycoming, a jig borer in the New York area, and one or two other tools comprised tool business last week. Final orders on the Subway list have not yet been issued, so no accurate list of machines awarded can be published. Remaining Navy tools have not yet been readvertised. Industrial inquiries and orders remain quiet, but dealers feel a little more hopeful.

CLEVELAND

The trade is anxiously awaiting several large lists, including those for the new Addressograph-Multigraph plant, the new Cleveland Lamp Works of G.E., retooling by the Peerless Motor Car Co. for all-aluminum cars, and additional tools required by Hupp to manufacture all bodies at Cleveland. Other trade is negligible.

PHILADELPHIA

A few orders for machine shop equipment, together with the receipt of some rather hopeful inquiries from scattered areas, featured the market the last two weeks. Some dealers reported a betterment in business in September, and there appeared to be a lessening of the tension which has prevailed.

DETROIT

October has been somewhat more profitable than August and September. It has also been more encouraging. Orders for new equipment have not been numerous, and no one expects them to be numerous during the balance of 1931. Car builders have farmed out an immense amount of die work to contract jobbing shops, so much in fact that no unused die shop capacity is now available, and none will be available for 60 or 90 days. The shops have found it necessary to buy some equipment and may be required to buy considerably more. Like the automobile manufacturers, however, they are extremely wary. They would far rather use makeshift equipment than buy new, and they even sacrifice contracts rather than make expenditures for equipment.

MILWAUKEE

October business is expected to show more favorably than September, itself an improvement over two previous poor months. While actual orders are still slow in materializing, many estimates are outstanding. Some orders for special equipment have been placed locally by Detroit automotive industries and the outlook is favorable. One manufacturer reports orders by wire for repair parts, instead of the usual mail inquiries for prices.

NEW ENGLAND

The machine tool market is still without definite trend, and fails to register an appreciable change from week to week. Uncertainty regarding foreign business continues a discouraging feature. Government closings have resulted in several sizable orders in this territory, particularly Connecticut. Some executives are hopeful of better business from automotive centers. Favorable sentiment is seen in steel plant improvement. Approaching holidays have resulted in a better order volume for electrical appliance plants, clock factories, and the like. The biggest drawback to general improvement is the habitual and decidedly overdone expressions of the panicky times.

CHICAGO

An occasional gleam of encouragement breaks the monotony of reports that no improvement is noticeable. The local office of a turret lathe builder had a good word to say about September activities. With this exception, and the report of a slightly better demand for twist drills, little change in market conditions is seen. The Great Northern Railroad, which has been in the market for a small list which included a five-ton crane and five other items, is expected to do some closing shortly. Dealers in used tools report the situation without change.

BUFFALO

There seems to be no material change in business since last month. There is considerable business pending, and there should be many orders placed as soon as there are any real indications of a resumption of business. Equipment is needed, and the need will be keenly felt in many industries as soon as orders make any demands upon them.

A few orders have been placed, but very few. The big industries are doing no buying. Quotations are being made on some business resulting from municipal and other government efforts to create employment. This may have some effect later on demand for contractors' equipment. The demand for electrical equipment in industry is extremely weak.

CINCINNATI

There is hope that steps being taken by financial interests will get the business piston off of dead center and set the market in motion. Business received by machine tool manufacturers is largely confined to small orders, and most inquiries are for single items. Local selling agents book a few scattering orders and have inquiries from a few users who are figuring on work that will require new equipment.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

In its economic aspect last week's news was more than usually important. It was not, however, as "grave" as some of the newspaper headlines suggested. It is said that a Sino-Japanese war threatens, but those who are best informed upon matters international do not appear to be alarmed, and the League of Nations is working hard to avert a struggle that would be so horrible, and would follow so closely upon the Chinese floods.

Then there is a news cable from Australia which announces that the question of consolidating the whole Commonwealth under one federal government would be submitted to the people at an election to be held about Christmas. But of still greater importance is the British election and the campaign that the Nationalist Party is making under the leadership of Ramsay MacDonald. The result means much to England, but the interpretation that will be given to it depends largely upon whether the observer is looking through Conservative or Liberal spectacles.

The most sensational predictions of what will happen are to be heard from those who profess to be clairvoyant in their political vision. The English facility for muddling through, however, is so great that we can probably rely upon the British body politic to adjust itself to the situation as it may develop.

Unnecessary Depression

These comments are submitted because the United States seems to be unnecessarily depressed by the concatenation of events which are being unfavorably interpreted by quite a number of bearish stock speculators who were bullish two years ago.

Amongst the items upon which attention is concentrated are the number of small bank failures reported from outside the larger cities; the hoarding of gold, which is probably exaggerated; and the export and earmarking of a somewhat larger quantity of the yellow metal that is being withdrawn by those who have credit balances here. Over $600,000,000 of gold has been exported or earmarked since the middle of September.

Just why this should cause trepidation is not clear. Only a few months ago banks, bankers and economists were disturbed by the huge supply of gold that the United States was said to be "sterilizing" to the disadvantage of the world's trade. This gold is now being put into circulation again, and the consequence is that everybody has cold feet. That it is only a mood that will pass there can be no doubt, but unless our bankers meet the situation philosophically it will cause some trepidation.

Meanwhile, the monetary usefulness of the world's gold supply is being rapidly impaired as one nation after another announces what is described as a temporary suspension of gold payments. Thus far the United States and France, with one or two less important powers, are the only nations that are really maintaining gold payments. Their reserves are so large that their bankers are unperturbed, but the result of Premier Laval's visit to the United States will be awaited with keen interest, and it is to be hoped that President Hoover can arrange a *modus vivendi* that will enable France and the United States to work together in re-establishing commercial and financial poise on both sides of the Atlantic.

Commodities Up

Such a possibility is to be inferred from last week's commodity markets. They were nearly all higher. Different reasons for the advances reported are given, but the fact is that with cheap credit, money is gradually finding its way into the commodity markets, which must sooner or later go still higher, as the surplus supply of credit finds investment in many of the staple products that are now to be had at less than the cost of production.

This tendency is already manifest, and just as soon as its significance is realized an active revival of commodity speculation would be absolutely in accordance with precedent. The advance in the New York Reserve Bank's rediscount rate from 2½ per cent to 3½ serves notice that the period of abnormally low money rates is at an end. The Clearing House has advanced its interest rate on deposits; banks' stocks have advanced sharply.

Normally the advance in commodities would be followed by a revival of speculative activity on the Stock Exchange, and there is no reason why the sequence of former years should not be followed in 1931. The Hoover Administration is doing everything that it can to bring about such a sequence. It has been instrumental in organizing a National Credit Corporation that will probably be provided with a capital of one billion dollars to be loaned to banks who require it. As this Credit Corporation proceeds to thaw out "frozen assets" it should be evident that the ground is being prepared for a real business revival.

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THE BUSINESS WEEK

October 21, 1931

Stabilization of fundamental financial factors continues to be disturbed by accumulating difficulties in foreign conditions and by delay in organizing domestic and international efforts. . . . The stimulus to confidence looked for from private bank pool and other domestic administration programs has slackened under poor publicity and slow organization, and effects on the banking situation and security markets are still uncertain. . . . The sharp tightening of money rates, which is so far their only evident influence, further postpones the prospects of constructive credit expansion, while deterioration of international relations and danger of further political and financial disturbances abroad make the outlook for cooperative action on a world scale more dubious. . . . Despite these disappointments there are some slight evidences of improvement in domestic business as internal economic adjustments proceed. . . . Basic commodity prices have apparently stabilized at bottom levels, while retail prices rapidly recede. . . . Employment shows some seasonal expansion, merchandise freight movement has risen to meet holiday requirements, while steel demand has quickened slightly from scattered sources. . . . Our index has shown reassuring resistance to further decline since August. . . . The continuous succession of shocks during the past two years has apparently hardened the nervous system of American business against bad news and developed immunity to further disturbance from foreign political and financial forces. . . . On the rock-bottom basis of domestic needs it is beginning to rebuild a more stable structure.

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Material Trends and Prices . . . .

The present situation in the metals market, as perhaps in that for many another material, is one in which the buyer appears to suspect that the absolute bottom has not been reached. That further liquidation of raw metals prices is hardly to be expected, is suggested by the accompanying graph of metals and general commodities prices expressed as percentages of their respective 1913 levels. Raw metals are selling at nearly half the pre-war figure and it is likely that the metals curve, instead of going much lower, will move up closer to the 1930 line.

(All prices as of Oct. 16, 1931)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$11.00@$12.00	$12.00	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	15.50
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.25	10.50	14.50
Furnace Coke — Connellsville, per net ton	2.40	2.40	2.60
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes — Pittsburgh, base, per 100 lb.	1.60	1.60	1.60

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Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.:

Chicago	4.62½	Cleveland	4.50	New York	4.75
Cincinnati	4.40	Detroit	4.00		

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

*Light plates.

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches						
		½	⅝	¾	⅞	1	1⅛	1¼
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh. 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots 73–10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots, 99%, N. Y	23.30
Copper, electrolytic, Conn	7.00
Copper wire, base, Chicago and Cleveland	9.37½
Copper wire, base, N. Y.	9.25
Lead, pigs, E. St. Louis	3.82½
Tin, Straits, pigs, spot, N. Y.	23.25
Zinc, slabs, E. St. Louis	3.45
Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:	
Brass rods, high	11.25
Brass sheets, high	13.00
Brass tubing, high	16.25
Copper, drawn round	13.62½
Copper sheets	16.12½
Copper tubing	15.62½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	29.00
Babbitt, com'l, intermediate grade	34.75
Babbitt, genuine, highest grade	43.50
Solder, bar	18.00
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.50	2.50	2.25
Light brass	2.00	1.75	2.00
No. 1 rod-brass turnings	3.00	2.75	2.25
Heavy copper	5.00	4.00	4.00
Light copper	4.00	3.75	3.50

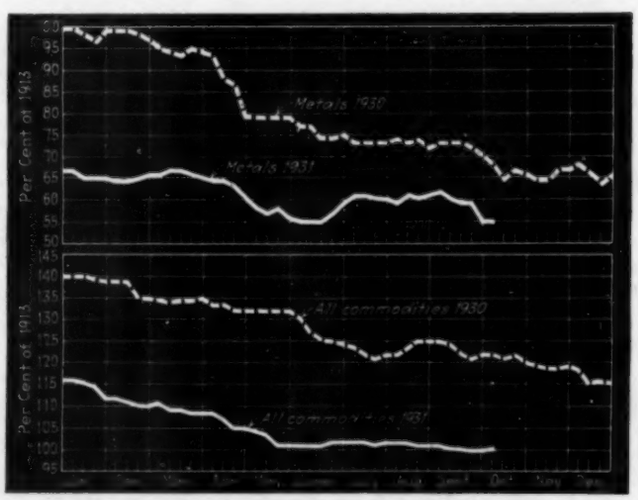
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight; per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	30–10%	40%	40%
Belting, rubber, trans., 1st	60–10–10%	60–10%	60%

Lumber — Per M ft., b.m., 12-16 ft. lengths, del., N. Y.:

Crating — Southern pine:
1x4-in. ..... $20.00 1x6-in. $22.00

Skids-Spruce:
2x4-in. $32.00 3x4-in. $27.00 4x6-in. $29.00 6x6-in. $38.00



Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

NEWS

ROBERT M. GAYLORD

CLAYTON R. BURT

H. S. BEAL

Gaylord Heads Machine Tool Builders Burt and Beal Vice-Presidents

Marked by unusually able addresses and by a large and representative attendance, the thirtieth annual convention of the National Machine Tool Builders' Association met at the Edgewater Beach Hotel, Chicago, Oct. 12 to 14. Partly because of the weather and partly because of the serious attitude of those attending there was little disposition to stray far from the meetings. Topics uppermost in the minds of those present included the possibility of an early upturn in business activity, the Russian situation, and the Swope plan.

Three new directors were elected, S. OWEN LIVINGSTON, 1st vice-president, Gallmeyer & Livingston Co.; E. A. MULLER, president and treasurer, King Machine Tool Co.; and H. S. ROBINSON, secretary and sales manager, Cincinnati Shaper Co. The new board organized by electing as president ROBERT M. GAYLORD, president, Ingersoll Milling Machine Co.; as 1st vice-president CLAYTON R. BURT, president and general manager, Pratt & Whitney Co.; as 2nd vice-president, H. S. BEAL, assistant general manager, Jones & Lamson Machine Co.; and by re-electing as treasurer G. E. RANDLES, president, Foote-Burt Co.

In his opening address PRESIDENT C. A. JOHNSON, Gisholt Machine Co., commented on the spread of the interest in equipment modernization from the business press to more general periodicals and to the daily newspapers. He expressed his belief in the inevitability of a higher price range for machine tools, occasioned by the greater productivity per unit and the consequently narrowed market.

General Manager E. F. DUBRUL reported completion of the work on the association's cost manual and announced that copies would be available before the first of the year. Extra copies will cost members $10, non-members $20.

After commenting on the disappointing performance of the business curve in recent months, and praising the recent action of President Hoover in calling for the establishment of a central credit pool, Mr. DuBrul suggested that business could aid in hastening general recovery by adopting these policies:

G. E. RANDLES

"1st. Those who are directors of banks should insist that their banks join whole-heartedly in the program of mobilization of reserves, which is the essential point of President Hoover's plan. They should also clean up all sick accounts, but with due regard to the ultimate possibilities of saving the patient as well as protecting the bank.

"2nd. Large depositors should look into the conditions of the banks with which they do business, and make it plain that depositors have a right to know that sound banking practices are followed. They should also do their share to impress on their bankers the necessity of a national viewpoint.

"3rd. Large corporations have drained deposits to New York from other cities where they were formerly kept for branch operation purposes. Such corporations should now look into the conditions of these outlying banks and restore their deposits to those that are sound.

"4th. All of us should work for better examination and control of the conditions of banks. We should study well the proposals that the Reserve Bank System be further strengthened by requiring all banks doing an interstate business to be members of the System.

"5th. We should all study the feasibility of having the Reserve Banks guarantee deposits in member banks, thus tying the member banks together as the Reserve Banks and Federal Land Banks are tied together.

"6th. We business men should study President Hoover's secondary recommendations which can be carried out only by Acts of Congress. Here are some questions involved:

Just how far should eligibility provisions be broadened?

Should they be extended to stock market loans?

Should there be more inflation than we have now?

If so, would it be controlled any better than it ever has been in the past?

Should the present power of the Reserve System to inflate credit be restricted, and if so how?

What effect on business and banking is now exercised by having Government bonds eligible for rediscount security."

Discussion of the Swope plan for industrial stabilization brought out more unfavorable than favorable opinion. There was evidently considerable concern over what might develop if any sort of governmental control once got a foothold in industry. And the question of where to find men capable of administering industry control seemed to be very real. As against these opinions it was pointed out that legislation setting up unemployment insurance of some kind is sure to come, and that it

would be better for industry to guide this development than to leave it entirely in the hands of legislators with an eye to votes rather than to the welfare of industry.

At the formal luncheon meeting on the second day of the convention, W. J. DONALD, managing director, American Management Association, spoke on "The Trade Association's Work for the Next Decade." Mr. Donald pointed out such impending developments as the keener struggle for the consumer's dollar that new products, directed marketing and lowered costs of doing business will bring about in the near future. Drawing a parallel with conditions following the Napoleonic and mid-19th-century wars, he predicted the likelihood of slowly falling prices during the next 10 to 20 years, relieved probably by occasional reactions. He expressed the opinion that there would be no serious changes in the Sherman Anti-Trust Law and that resumption of normal or near-normal business activity would see the revival of the trend toward mergers interrupted in 1929.

He pointed out that trade associations have attempted to justify their existence during the past decade by indirect price maintenance through such legal means as standard cost systems, trade statistics, cooperative trade promotion, tariff and open-price activities, trade practice rules and codes of ethics, and that they have failed of their objective. Many associations that have done little else have already begun to fade from the picture.

As a constructive program he proposed active aid to members in getting manufacturing and distributing costs down to the point where business can be done profitably within the price level at what turns out to be normal volume. The New York Trade Executives group has set up a program for the year. On the manufacturing side are listed lowered production costs, simplification, standardization, specification, reduced inventories, lessened shipping costs, better equipment, cooperative technical research, cross-licensing of patents.

JOHN M. CARMODY, editor of *Factory and Industrial Management*, addressed the members on "What Is Going On in Russia?" Most of the facts and opinions included in his remarks have appeared in his articles in *American Machinist*, Vol. 75, Nos. 13 and 15, pages 483 and 547.

RALPH E. FLANDERS, chairman of the exposition committee, reported that order blanks for space at the 1932 exposition, which is scheduled to be held at Cleveland, Sept. 10-17, 1932, would be mailed Nov. 1, that applications would close Dec. 1, and that drawings for position would be held Dec. 10.

The following resolutions were unanimously adopted by the convention:

RESOLVED: That we urge upon the President of the United States the desirability of calling at an early date an international conference to consider means for stabilizing monetary standards.

RESOLVED: That while the Association approves the ideas back of the Swope plan and will give its best thought to the task of making them effective, it recognizes a serious limitation in the fact that some important factors of business fluctuations lie in the fields of finance and general public speculation, on which a due portion of responsibility must be laid. It also recognizes the difficulties interposed by the extreme fluctuations to which the machine tool business is subjected, fluctuations which are more severe than in any other line of industry for which statistics are available. We are furthermore disinclined, in view of past history, to tighten the bands of government regulations or control.

RESOLVED: That while we have no expectation that the fluctuations of business are capable of complete control, we do urge a consideration of the fundamental importance of investment policies in the maintenance of business stability; calling attention to the fact that new investment is the normal outlet for idle funds, and that courage and wisdom in their disposition may be expected to greatly mitigate the severity of a depression.

Machine Tool Men Hear Dr. Klein

DR. JULIUS KLEIN, Assistant Secretary of Commerce, was the featured speaker Oct. 14 at the Olympia Fields Country Club, Chicago, on the occasion of the first joint gathering of machine tool builders and dealers in recent years. The builders were the guests of the dealers at this dinner which marked the opening of the regular meeting of the Associated Machine Tool Dealers, and the attendance exceeded 150.

MASON BRITTON, vice-president, McGraw-Hill Publishing Co., Inc., was introduced by PRES. E. P. ESSLEY of the dealers' association, and in turn introduced Dr. Klein, who commented on the market survey work of the Department of Commerce and on the current business situation. He explained that the bottom of the present depression was apparently reached in January and that the curve of business activity has been moving horizontally since then. Experience would indicate that the next change of direction will be upward.

DR. ALAN H. ALBERT, executive assistant to PRES. RUFUS DAWES of the Chicago Centennial of Progress celebration of 1933, told how the enterprise has been financed and of the gratifying progress that is being made with the construction of buildings and the arrangement of events and exhibits.

The machine tool builders were especially invited to attend the session on Thursday morning at which the program included subjects of mutual interest to manufacturer and distributor. N. E. HORTON, Sherman Corp., spoke on market analysis, and G. D. LEE, Commercial Investment Trust, on installment selling. JOHN H. VANDEVENTER, industrial consultant, *The Iron Age*, and W. H. RASTALL, chief, Industrial Machinery Division, Bureau of Foreign & Domestic Commerce, also spoke.

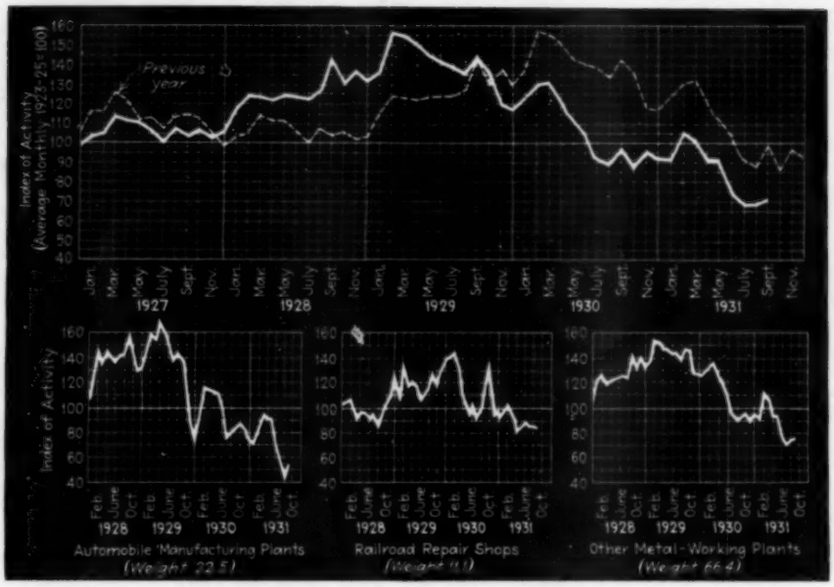
At the business meeting of the Associated Dealers, Messrs. Essley and A. G. BRYANT, respectively president and secretary, and largely responsible for the growth of the association, retired and the following new officers were elected: President, W. K. STAMETS; secretary, HARRY BARNEY. As both of the new officers head Pittsburgh machinery houses the office of the organization automatically moves from Chicago to Pittsburgh. H. E. OATIS was chosen vice-president. New directors are JOHN SAUER, JR., H. A. SMITH, and H. W. SWIND.

Hageboeck Heads Gray Iron Institute

A. E. HAGEBOECK of the Frank Foundries Corp., Moline, Ill., was elected president of the Gray Iron Institute at its fourth annual meeting at West Baden, Ind., last week. DON MCDANIEL, Decatur Casting Co., was named 1st vice-president and J. L. CARTER, Sacks-Barlow Foundries, Inc., 2nd vice-president. Mr. Hageboeck, Mr. Carter, G. W. BLAKESLEY of the Security Stove & Mfg. Co., H. B. HANLEY of the American Laundry Machinery Co., R. R. MONROE of the Des Moines Foundry & Machine Co., and E. B. SHERWIN of the Chicago Hardware & Foundry Co., were elected to the board of directors for 3-year terms. Some 80 members and guests registered at the meeting, the program of which was given in *American Machinist* last week. Officers announced a plan to extend group cost activity now established in 16 foundry centers and to arrange similar localized handling of technical and merchandising problems.

Ryerson Meeting

Approximately 650 attended a lecture and demonstration on Allegheny Metal at the Jersey City plant of Jos. T. Ryerson & Son, Oct. 17. G. VAN DYKE gave relative physical, corrosion- and heat-resisting properties of stainless steel, stainless irons and the chrome-nickel irons. He showed the increasing corrosion and heat-resistance with increase in the alloy content, and brought out that the materials are austenitic in structure and should be kept or returned to this condition to maintain maximum corrosion resistance. In addition, Mr. Van Dyke gave tabulated data on the tensile strength and creep values at elevated temperatures, in order to show that the former are for quick tests and must not be used in the design of equipment, but that the creep value must be used in order to prevent warpage and consequent destruction of apparatus subjected to high temperatures.



September Metal-Working Operations Show Slight Increase

A slight increase in general metal-working activity is indicated by the reports on consumption of electrical energy for power purposes, contrasting with a static period during the last two months. The final figure for September was 71.2, as compared with 68 in July and August, 78.2 in June, 89.1 in May, 92.4 in April, and 100.3 in March. These figures are all adjusted for 26 working days, as are subsequent ones.

The automobile shop index, 94.1 for March, 90.8 for April, 91.5 for May, 71.3 for June, 55.9 for July, and 43.6 for August, rose ten points to 53.7 in September. The railroad repair shop index, 94.3 for March, 82.8 for April, 84.7 for May, 89.2 for June, 84.3 for July, and 85.5 for August, dropped slightly to 84.0 for September. Ferrous and non-ferrous metal-working plants outside these two groups had a March index of 100.5, an April index of 94.6, a May index of 94.1, a June figure of 78.6, a July figure of 69.3, and an August index of 73.3, increased again to 75.0 in September. The cause of change, therefore, in the combined index is principally a result of changes in automobile and metal-working plants. Railroad repair shops have held even, except for a slight rise in June. Metal-working slacked badly after May and has stayed down. Automobile production reduced heavily every month, but took on more workers in September, reflected in the energy figures and hence in the total index.

When the figures are adjusted for seasonal variations, slight revisions occur. The railroad repair shop index rises to 87, and the metal-working index rises to 76, while the automobile index drops to 52. Railroad repair shop seasonally adjusted indexes were, in previous months, August 96.2, July 92, June 96, May 92.5, April 80.1, March 90.3. Similar automobile indexes were, August 45.3, July 56.3, June 69.8, May 78, April 76, March 88.2. Similar figures for other metal-working plants are, August 79.3, July 73.5, June 82.8, May 91.7, April 92.4, March 95.3. These give a seasonally adjusted figure for the entire group of 71.9, down two points from the 73.5 of August, but about equal to the 71.7 of July. The June figure was 81.4, May 87.3, April 87.9, and March 92.9.

Freight Loading At High

Loading of revenue freight for the week ended Oct. 3 totaled 777,837 cars, the highest for any week so far this year. The previous high week was that of May 2, when 775,291 cars were loaded with revenue freight. The total for the week of Oct. 3 was an increase of 39,808 cars above the preceding week, but a reduction of 193,418 cars below the corresponding week last year and a reduction of 402,110 cars under the same week two years ago.

Railroads Report Eight Months Income

Class I railroads of the United States for the first eight months of 1931 had a net railway operating income of $350,-943,778, which was at the annual rate of return of 2.14 per cent on their property investment, according to reports just filed by the carriers with the Bureau of Railway Economics. In the first eight months of 1930, their net railway operating income was $556,-466,261 or 3.45 per cent on their property investment.

Machinery Manufactures Classified By States

The Machinery portion of the 1929 Census of Manufactures has recently been issued by the Census Bureau, Department of Commerce, and includes the following totals, which may be of interest to metal-working manufacturers:

Machine tools, total	$186,060,949
Connecticut	18,315,601
Illinois	16,288,217
Indiana	6,413,072
Iowa	2,634,403
Massachusetts	14,765,242
Michigan	6,796,685
New Jersey	3,058,538
New York	12,580,776
Ohio	56,324,613
Pennsylvania	11,650,543
Vermont	10,327,046
Wisconsin	10,098,105
Calif. and Wash.	314,991
Del., Md., Me., N. H., and R. I.	13,984,694
Other States (Ky., La., Minn., Mo., and S. Dak.)	2,508,423
Metal-working machinery, total	50,335,753
Rod and wire-working machinery, total	4,076,830
Connecticut	1,667,241
New York	70,278
Ill., N. J., Ohio, and Pa.	1,883,317
Other States (Calif., La., Mass., Minn., Ore. and Wis.)	455,994
Rolling-mill machinery, total	$19,617,419
Ohio	4,904,614
Conn., Ill., and Ind.	558,582
Mass and Pa.	14,116,245
Other States (Ky., Mich., N. Y., and Wash.)	37,978
Sheet-metal-working machinery, total	23,138,737
Illinois	2,552,055
New York	8,225,963
Ohio	5,107,507
Calif., Ore., and Wash.	2,231,670
Conn., Mass., and Vt.	831,286
Other States (Colo., Ind., Iowa, Mich., Minn., Mo., N. J., Pa., Tenn., Va., and Wis.)	4,193,256
Wire-drawing machines, total	1,619,482
Massachusetts	478,930
New Jersey	49,273
Ill., Ohio, and Wis.	1,016,597
Other States (Conn., Mont., N. Y., and Pa.)	74,682
Other metal-working machinery (Conn., Ill., N. J., Ohio, and Pa.)	1,883,285

Simplified Practice Cancellation

The Simplified Practice Recommendation covering arbor holes for circular saws and grinding wheels used on portable electric handsaws, drafted at a general conference early last year, has been dropped from the schedule of the Division of Simplified Practice of the Department of Commerce due to disagreement of manufacturers of portable electric machines with the particular sizes and shapes covered by the proposed recommendation. If those concerned show sufficient interest, the project may again be taken up at a later time.

Gear Manufacturers Discuss Technical and Commercial Questions

Pittsburgh, Pa.—"How the A.G.M.A. Has Benefited the Gear Manufacturer" was the keynote sounded by F. W. SINRAM, President of Gears & Forgings, Inc., and honorary president of the American Gear Manufacturers Association. Mr. Sinram reviewed the returns accruing to those members of the association who attended its meetings and served on its committees. To meet in discussion such men as Buckingham, Miller, Waterman, Ross, McMullen, and Eberhardt was an opportunity in itself. The association has evolved 32 standards and recommended practices since its inception in 1917.

The constructive influence of uniform cost accounting has already yielded benefits, which will be still greater when these practices are universally employed. The employment of the machine-hour rate has been adopted by all progressive manufacturers operating in the industrial gear field. The futility of sacrificing profit to volume was emphasized as the only result is to help lower the whole price level. The added volume, gained temporarily, ultimately proves costly.

While the association has made progress in the collection and dissemination of statistics and other valuable information to its members, there is much more to be done. Members should know the total amount of invested capital in the industry, the aggregate annual volume, the total number of people employed, unfilled orders, business booked, and shipments.

Two papers on the subject of "Tip Relief" aroused great interest and provoked spirited discussion. T. R. RIDEOUT, Nuttall Works of Westinghouse Electric & Manufacturing Co. presented the practical aspects, and R. E. PETERSON, of the same concern, presented the theoretical side.

According to Mr. Rideout's paper, tip relief is often referred to as an error introduced to offset other errors in the gears. This viewpoint is not entirely justified since tip relief serves other purposes as well and some errors in gear cutting are unavoidable. Tip relief in some form is necessary to obtain quiet long-wearing gears. It will delay engagement until the sharp corner of the gear tooth has passed the theoretical initial point of contact, avoiding the possibility of gouging or scraping, with the resulting vibration, noise, and serious wear. Even if the involute curves were exactly tangent to each other at the point where contact would normally first occur, there is a tendency for the sharp corner of the gear to break the film of lubricant momentarily.

The rate of gear wear is much less after the inevitable feed marks and surface imperfections of a pair of new gears have been worn away. It sounds paradoxical, but the judicious use of tip relief has proven itself to be of value in reducing the actual amount of wear.

The deformation of the teeth under load is slight under normal conditions and moderate speeds. However, the ever increasing tendency for higher speeds and loads makes it necessary to check these deformations to determine if there is a possibility of their causing interference. The bending deflection of the teeth will make the base pitch of the pinion small and that of the gear large with the resulting premature engagement of the pair of teeth following those that were carrying the entire load, unless the tips of the teeth are relieved. A similar condition is caused by elastic compression or flattening of the teeth. The deformation of the teeth varies with the load, material, heat-treatment, tooth form, and type of gear, and all these factors must be considered in specifying the amount of relief necessary. But the amount of tip relief advantageous for theoretically accurate gears is small indeed when compared to that necessary to compensate for the errors introduced in the process of production.

Mr. Peterson in his paper brought out some qualitative features of the problem. Previous to the theoretical engagement of perfect gearing there will be a nominal opening between the tip of the gear tooth and flank of the pinion tooth. It is possible to compute this opening as a function of tooth position.

If the gear is held stationary and a torque applied to the pinion, the latter will rotate slightly because of the bending and compressive deformation. The opening between the teeth about to engage is shortened. When the nominal opening becomes equal to the movement by the pinion relative to the gear, caused by tooth deformation, initial engagement actually accurs premature to nominal engagement.

Delayed disengagement also results from tooth deflection and errors. The periods of premature engagement and delayed disengagement can be surprisingly large, in some instances amounting to 50 per cent of the line of contact.

Premature engagement with its gouging action and delayed disengagement with its scraping action may be prevented by tip relief—a removal of material from the outer portion of the tooth profile. The condition, that premature engagement and delayed disengagement shall not occur, is that no load shall be carried by engaging or disengaging teeth when at the normal position of engagement and disengagement. This can be obtained in both cases by tip relief of an amount sufficient to close the opening caused by errors in manufacture and an additional amount to allow the teeth in contact to carry the total maximum load and to deflect accordingly.

P. C. DAY of the Falk Corporation spoke on "Good Practice in the Manufacture of Speed Reducers." He pointed out that the designer and manufacturer of speed reducers have tough problems to solve because of the diversity of operating conditions. But the maker of machinery will adopt speed reducers in substitution for an untidy mess of gears, if he can obtain obvious benefit without additional cost to himself or his customer. The only answer to the problem is standardization and quantity production.

Mr. Day pointed out that this was exceedingly difficult, his own concern having to manufacture 177 different units each with several speed ratios, making the total possible combinations close to 3,000. Then there must be a standard line of motor bases, to fit any motor that may be used with any unit.

The catalog must contain complete and definite data, as the prospective customer has no patience to commence negotiations on vague information. Before it can be published, designs must be completed and production costs carefully analyzed. The remainder of Mr. Day's paper was on design details.

The commercial standards session was started with a report by E. S. SAWTELLE, Chairman of the Commercial Standards Committee. This was followed by an address, "The Practical Application of Uniformity in Cost Practice for an Industry," by J. B. SEHL, Cost Agent, American Drop Forging Institute.

JOHN P. WRIGHT, Foote Bros. Gear & Machine Co., addressed the meeting on "How Management Can Readily Be Informed from Our Cost Records as to the Profit or Loss Sustained on Miscellaneous Special Non-schedule Jobbing Orders."

J. HARPER JACKSON, the Pittsburgh Gear & Machine Co., spoke on "The Fallacy of Costing on an Average Basis."

"Analysis of Recent Bid on Gears" was presented by the Pittsburgh Gear & Machine Co., the Foote Gear Works, and several others. The afternoon of Oct. 16 was devoted to visiting several local gear manufacturing plants.

During the first general session on Thursday afternoon the following committee heads reported: A. A. Ross, General Standardization; B. F. WATERMAN, Sectional Committee on Standardization of Gears; GEORGE L. MARKLAND, JR., Representative of American Standards Association and U. S. Chamber of Commerce; C. B. HAMILTON, Metallurgical; R. B. ZERFEY, Keyway; and D. T. HAMILTON, Nomenclature.

The Saturday morning session was devoted to further committee reports by the following: W. H. HIMES, Worm Gear; IRA SHORT, Herringbone Gear; T. RIDEOUT, Railway, Mill, and Mine Gear; F. W. ENGLAND, Inspection; H. R. MOYER, Non-Metallic Gear; and M. T. SCHUMB, Library. The next semi-annual meeting will be held at Cleveland, Ohio.

National Safety Council Sessions Foster Lively Discussion

Chicago, Ill., October 24—While the attendance at the automotive and machine shop and power press sections of the National Safety Council was not as large as in other years, there was an earnestness on the part of those present that indicated a desire to take back something really worthwhile. Plant managers on the whole have been far-seeing enough not to curtail convention expenses in connection with safety work. In this regard, several speakers stressed the fact that it is the management that must be sold on safety. It was indicated, however, that "higher-ups" often fail to exercise sufficient interest to produce the plant morale whereby the work of the safety organization will receive full cooperation.

An increased "run" of industrial accidents when reemployment begins on an extensive scale should be guarded against, said MARVIN A. HEIDT, Director of Personnel, Budd Wheel Corp. He throws the full responsibility of safety directly upon the management. The management must teach the employee to think, talk, and act safely. In this lies the very root of accident prevention.

G. S. THOMPSON, engineer, Gnau & Co., concluded that a press is not necessarily safe because it is guarded and felt that there was too much confidence in guards and too little thorough inspection. Accidents often result from machine failures that the guard in no way could prevent. Guarding to be effective should be consistent and should never be overdone, as the operator will find some means of circumventing the guard if his output is restricted and his normal tempo interfered with. Mr. Thompson recommended a morning and noon inspection of all press equipment. Failures are usually progressive and can be checked before a serious accident occurs.

The accident frequency (number of accidents per million man-hours worked) drops from an average of 30 in the small shops to an average of 10 in the larger, well-organized plants where safety is carried on by a special department. Against these figures, H. C. HOWSAM, superintendent, Hubbard Spool Co., told of progress made in safety work in his relatively small plant. Not only is the press itself guarded, but no die is built without a guard built integral. Guards are placed over all treadles. Spot-welding machines are shielded to prevent metal being spattered on the workman's feet, and ventilating fans remove oil fumes.

L. BORAKS, power press engineer, Liberty Mutual Insurance Co., indicated that the diemaker is the key man in safety work and that the safety engineer should win his cooperation so that dies may be correctly guarded when first built rather than as an afterthought.

That machine tool builders today are making safety a matter of forethought in machine design rather than one of afterthought is the opinion of S. MORGAN, director of education, Buick Motor Co. This factor is considered on the drawing before the machine is built. Use of hydraulic feeds has eliminated gears and levers that have been the cause of some shop accidents. Since only 10 to 15 per cent of all accidents can be eliminated by mechanical means, Mr. Morgan centers attention on the human factor. Training and helping the man to form the correct habits so that the impulsive or involuntary movement made in an emergency will be in a safe direction is what makes an operator "safety conscious." Campaigns often are used in this direction but are simply bolsters for weak foremen upon whom the responsibility for safety education should fall. When the foreman has learned to delegate the responsibility of the machine to the operator for quality and quantity, he will find time enough to give safety the attention necessary without diverting too much attention from his other duties. Through the efforts of foremen at the Buick plant, the frequency rate has dropped from 13.7 to 10.9 accidents per million man-hours worked, while the severity rate has dropped from 0.98 to 0.91 days per thousand hours worked. Every foreman is held strictly accountable for the condition of his department, including safety devices and all equipment likely to cause injury through failure. It is also his job to see that his men are properly equipped with protective clothing.

A man is an accident-prone employee because of certain characteristics: physical defects, lack of training, and personal attitude, according to W. GRAHAM COLE, director of the safety service, Metropolitan Life Insurance Co. The first can be corrected by initial and periodical physical examination, the second by re-training and adjustment of conditions, and the third and most difficult phase of treatment requires the development of some method to bring the employee into closer and yet respectful contact with his superiors and to educate him gradually as to his duties to society and to his company. Frankness in treating such cases is of paramount importance.

A number of illustrations of recent developments in power press and machine shop guarding were given in a session in which E. J. SMITH, Western Electric Co., P. G. HUNTER, Motor Wheel Corp., R. F. THALNER, Buick Motor Co., and WM. T. KIRTLAND, Ternstedt Mfg. Co., took part. "The last thing I think of is the mechanical guard," said Mr. Hunter in discussing the protection of large presses. "They are always subject to failure." He relies more on steel hooks and wooden paddles for feeding pieces than on guards. He contended that a great deal depended upon the selection of proper press speed so as to maintain a uniform rhythm that would be neither too fast to fatigue the operator nor too slow as to allow him to "star-gaze." In a moment of inattention an accident will occur. Serious injuries often result from the failure of major press parts.

Mr. Kirtland brought out the point that the simplest and easiest attached guard is the most effective and generally the one that interferes least with the operator. There is also less tendency on his part to lock the guard out of operating position in order to increase production. Some of the newer guards used in his plant will be illustrated in *American Machinist*. This particular session, being a joint one of the automotive and machine shop section and the power press section, drew the largest crowd, approximating 300.

W. J. GRAVES, Michigan Mutual Liability Co., was elected chairman of the power press section. A. L. KAEMS, Simmons Co., was elected vice-chairman, and E. J. SMITH, Western Electric Co., Hawthorne Works, secretary and News Letter editor.

C. M. DOTTERRER, Graham-Paige Motors Co., was elected chairman of the Automotive and Machine Shop Section; CARL STORCK, General Motors Corp., vice-chairman; and E. C. WALKER, Dodge Brothers Corp., secretary.

Leeds & Northrup Win Employee Plan Prize

Leeds & Northrup, Philadelphia, manufacturers of electric measuring instruments, have been awarded $2,000 by B. C. FORBES for their system of providing continuous employment for 1,000 employees and other beneficial emoluments for workers. The award was made on Oct. 14, two checks covering the amount having been presented on that day by Mayor HARRY A. MACKEY, of Philadelphia. The contest was conducted "to find the best employer-employee plan now in operation that makes for the economic independence of the workers, promotes their happiness and safety, thereby increasing their usefulness to the country." A second prize of $300 went to the Proctor & Gamble Co., and two third prizes of $200 each went to the General Electric Co., and to Westinghouse.

Foundry Equipment Makers' Report

Net orders for September were indexed at 31.9 by the Foundry Equipment Manufacturers' Association. Shipments were indexed at 29.6, unfilled orders at 35.6, and the three months' average of gross orders raised to 29.2. These reports are on the basis of average monthly shipments for 1922-24 taken as 100.

Dr. Lillian Gilbreth Awarded Gilbreth Medal

Announcement of a Gilbreth medal for achievement in management, awarded this year to DR. LILLIAN M. GILBRETH, was made at the annual dinner of the Society of Industrial Engineers, holding its 18th annual convention at Pittsburgh Oct. 14-16. One full day was designated as Gilbreth Day. Presentation of the medal was made by JOHN M. CARMODY, editor of *Factory & Industrial Management*, again elected president of the society. L. W. WALLACE, executive secretary of the A.E.C., introduced PROF. JOSEPH W. ROE, who spoke on "Frank Bunker Gilbreth." Dr. Gilbreth replied to the tributes, and indicated the family's intention to "carry on." The Emerson trophy of the Society was then awarded to the Detroit chapter.

The convention opened with an address of welcome by THOMAS A. DUNN, president of the Pittsburgh Chamber of Commerce. ROY H. FAULKNER, president of the Auburn Automobile Co., delivered an address on "The Way Back—As We Saw It," outlining the recent progress of Auburn. E. C. BRANDT, assistant works manager, Westinghouse Electric Mfg. Co., emphasized the purpose and responsibility of a maintenance department in one of the two papers presented at a luncheon of the maintenance engineering group. J. E. ANDERSON, manager of structural maintenance, Pittsburgh Plate Glass Co., outlined the complete program set up for inspection and repair of physical properties for his concern. R. A. BALZARI of the McGraw-Hill Publishing Co. meanwhile indicated the relation of advertising and sales planning in distribution to the production problems at a luncheon of the sales management group. Several talks on Russia were given at one of the meetings. Speakers included JOHN M. CARMODY, CHARLES E. STUART, and WALTER N. POLAKOV.

The annual meeting of the Gilbreth International Fatigue Committee opened Gilbreth Day. PROF. GEORGE H. SHEPARD, chairman, presented the annual report. DR. J. R. GARNER and DR. GEORGE H. FISHER presented papers. Other papers were presented at various sessions by R. L. SACKETT, RALPH E. BLAKELOCK, ALLEN H. MOGENSEN, MORRIS L. COOKE, G. M. MCILLVEEN, HAROLD V. COES, DAVID HIMMELBLAU, HUGO DIEMER, GORDON RIELY and PERCY BROUN.

SAE Transport Meeting Scheduled Next Week

The Ninth National Transportation Meeting of the Society of Automotive Engineers will be held at the Hotel Shoreham, Washington, D. C., from Oct. 27-29. Included in the technical papers are those on "Commercial Application of Diesel Engines in Motor Vehicles," by G. A. GREEN, of the General Motors Truck Corp.; "Chassis Lubrication," by A. J. SCAIFE, of the White Motor Co.; "What the Bureau of Standards Is Doing for Business," by DR. G. K. BURGESS, director; "Relation of the Motorcoach Body to the Chassis," by W. C. NAEGEL, Bender Body Co.; "Relation of the Motorcoach Chassis to the Body" by G. H. SCRAGG, International Motor Co., and "The Equipment and Operation of Fleet Repair Shops versus Manufacturers' and Commercial Repair Shops," by J. M. ORR, of the Equitable Auto Co. Various papers on transportation and maintenance will also be given and the annual National Transportation Dinner will be held the evening of Oct. 29, with WILLIAM P. MACCRACKEN, JR., as toastmaster.

Dr. Lillian M. Gilbreth

PERSONALS

LEON PRATT ALFORD of New York City will be presented with the Henry Laurence Gantt Memorial Medal at a special dinner to be held in his honor at the Hotel Pennsylvania, New York, Oct. 29. The presentation will be made by E. O. GRIFFENHAGEN of Griffenhagen Associates, Chicago, and president of the Institute of Management of the American Management Association, who is chairman of the Gantt Medal Board. HAROLD V. COES, manager of the Industrial Department of Ford, Bacon & Davis, Inc., will present Mr. Alford. ROY V. WRIGHT, president of the A.S.M.E., will speak on "Research in Engineering Economics." The Gantt Medal is given annually in recognition of outstanding accomplishment in management engineering, in memory of Henry Laurence Gantt, who was one of the leading contributors to the development of the science and art of management.

EDWARD E. SHUMAKER, president of the RCA-Victor Co., New York, N. Y., has resigned effective Jan. 1. He has been a member of the Victor organization since 1904, and is carrying out his repeatedly asserted intention to retire at the age of 50.

REX BEISEL has been appointed assistant chief engineer of the Chance Vought Corp., Hartford, Conn. He was formerly connected with the Sparton Aircraft and Curtiss companies.

W. WEIR HENRY, of the Taunton-New Bedford division of the Revere Copper & Brass, Inc., Taunton, Mass., has been transferred to the Revere general sales department in New York.

R. L. AGASSIZ, chairman of the board of the Calumet & Hecla Consolidated Copper Co., has been re-elected president of the Copper & Brass Research Association. Vice-presidents elected are F. S. CHASE, LOUIS S. CATES, H. DONN KERESEY and C. D. DALLAS. C. T. ULRICH was elected treasurer, H. FOSTER BAIN, managing director, WILLIAM A. WILLIS, manager, and BERTRAM B. CADDLE, secretary.

JOHN A. DROEGE, vice-president and general manager of the New York, New Haven & Hartford Railroad, will retire Nov. 1. He has been connected with railroads fifty-one years, twenty-seven of them with the New Haven, and will retain his connection with his connection with the company in an advisory capacity. ROBERT L. PEARSON will become general manager and JAMES O. HALLIDAY and EDWARD E. REGAN, assistant general managers. The positions of manager of transportation and general superintendent will be abolished.

W. A. JACKSON, general purchasing agent for 48 years of the Walworth Co., New York City, has retired. He will live on his farm near Laconia, N. H. No successor will be appointed.

E. S. JUDKINS, for several years purchasing agent for the Ashton Valve Co., Cambridge, Mass., has been transferred to the sales department.

RALPH B. KRAFT, 5331 Harper Ave., Chicago, Ill., has been appointed representative for the Hill Clutch Machine & Foundry Co., 6400 Breakwater Ave., Cleveland, Ohio, for the territory including Illinois, Indiana, Wisconsin, Missouri, Kansas and Minnesota.

HERMAN MERKER, secretary of the Pressed Steel Tank Co., Milwaukee, Wis., has been placed in charge of market research and development for the company. He was formerly in charge of the sales department, duties which have been given to P. T. BABCOCK.

AL J. MOORE, foundry superintendent, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., is on a leave of absence.

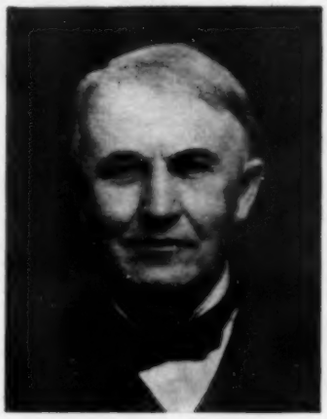
OLIVER SMALLEY, director of the Technical department, Gray Iron Institute, Inc., Cleveland, addressed the September meeting of the Detroit Foundrymen's Association recently.

ROBERT L. STREATER, vice-president since 1920 of the United States Aluminum Co., Pittsburgh, and general superintendent of fabricating plants, has resigned.

C. H. UPSON, 1012 Traction Bldg., Cincinnati, Ohio, has been appointed representative in that territory by the Union Chain & Mfg. Co., Sandusky.

G. E. WILSON, formerly head of the Delco-Remy Corp., Anderson, Ind., sailed Oct. 15 for a month's stay in Germany in the interests of General Motors. He will devote most of his time to affairs of the Opel Motor Works.

ANDRE CITROEN, French manufacturer of the automobile bearing his name, arrived in New York Oct. 13. While here, M. Citroen will be entertained at luncheon by WALTER P. CHRYSLER, will make a visit to Philadelphia and Detroit, and will address the Conference of Major Industries in New York City Oct. 21.



Thomas A. Edison

THOMAS ALVA EDISON, 84, scientist and inventor, known for years as the "Wizard of Menlo Park," died Oct. 18 after a lingering illness caused by a complication of diseases. His place in history is secure as the inventor of the incandescent lamp, the phonograph, and motion pictures; he had been issued over 1,150 patents during his lifetime. His inventions cover practically every field and at one time came at the rate of one every two weeks. He was America's most prolific inventor and possibly its greatest scientist. Possessed of a prodigious energy, he began his experiments at the age of 11, selling newspapers and garden produce to earn the money for his experiments. When he was 29 he was already so famous that he had to move his laboratory to Menlo Park, N. J., to avoid crowds. It was there he invented the incandescent electric light. His researches and discoveries extended throughout his life and included every field of endeavor in which he visualized a need. Much of his recent study has been concerned with the making of rubber from the goldenrod, since the rubber plant is not native to this country.

DR. SAMUEL STRATTON, 70, distinguished physicist, chairman of the Massachusetts Institute of Technology and former director of the Bureau of Standards, died suddenly Oct. 18 in Boston just after dictating a tribute to his good friend, THOMAS A. EDISON, with whom he was associated as advisor on the Edison scholarships.

PHILIP BINGMAN, 67, at one time factory manager for the Bloomstrom Automobile Co., died in Detroit, Oct. 4. During the year 1900, as a member of the firm of Wilds & Bingman, bicycle manufacturers, he built a one-cylinder motorized tricycle. Also with WALTER MARR, he aided in the construction of the first Buick car.

W. SHIVES FISHER, 75, former president of the Canadian Manufacturers' Association, died in St. John, N. B., Oct. 15. With the late R. B. EMERSON he established in 1878 the present business of Emerson & Fisher, Ltd., of which he was vice-president. He also founded and was president of the Enterprise Foundry Co., Sackville, N. B., and a director of the New Brunswick Power Co.

A. C. GOLDMAN, 53, vice-president of the Sterling Brass Co., Cleveland, died Oct. 13, at Erie, Pa., as the result of an automobile accident.

WALTER S. GURNEE, 59, associated with the Power Specialty Co., New York, until five years ago, died at Tucson, Ariz., recently.

RICHARD R. HARRIS, 75, formerly general manager of sales for the Pittsburgh (Pa.) Steel Products Co., subsidiary of the Pittsburgh Steel Co., died at his home in Brantford, Ont., Oct. 12. He had retired in 1927.

CHARLES L. HEISLER, 69, mechanical engineer of Schenectady, N. Y., died Oct. 13 at his summer home in Rock City Falls. He was at one time superintendent of the Dunkirk Engineering Co., and one of his first inventions was the Heisler geared locomotive, manufactured by the Heisler Locomotive Co., which he founded. He also designed a heavy-duty reciprocating pumping engine and formed the Heisler Pumping Engine Co., in Bucyrus, Ohio, of which he was president and chief engineer for several years. He developed and invented many locomotive improvements and also contributed to machine tool design.

E. H. MAYTAG, 67, associated with his brother, FRED L. MAYTAG, for 32 years in the washing machine manufacture business in Newton, Iowa, died Oct. 6 there, following an auto crash Sept. 10.

SIR JAMES MCKECHNIE, leading British naval architect and formerly managing director of Vickers, Ltd., died Oct. 14. Under his direction, the Vickers works at Barron produced during the World War every kind of armament from battleships to small shells. He was also a director of Vickers-Peters, Ltd.; Canadian-Vickers, Ltd.; Internal Combustion Locomotives, Ltd., and Centrifugal Separators, Ltd.

HENRY W. MYERS, 55, connected with the Otis Elevator Co. for 15 years, died suddenly of heart disease at his home at Yonkers, N. Y., Oct. 9.

HENRY E. NICKERSON, 72, prominent in the National Hardware association and widely known in the metals and steel trade, died at Providence, R. I., Oct. 9.

ALBERT JEFFERSON SAYERS, 61, noted Link-Belt engineer, died in Chicago, Oct. 11. He was a leading designer of coal handling and preparation equipment.

ROBERT BRUCE ABBOTT, 61, automotive expert, died Oct. 12, in Highland Park, Mich.

WALTER J. MITCHELL, 81, former iron and steel manufacturer of Cincinnati, died in Manchester, Mass., Oct. 9. He had retired about 30 years ago.

FREDERICK J. SMITH, 75, treasurer of the Winter Bros. Co., Wrentham, Mass., from 1914 to 1926, and an outstanding figure in the tap and die industry, died at his home in Mansfield, Mass., Oct. 10. He had entered the employ of the S. W. Card Mfg. Co., Mansfield, Mass., in 1878 as a tool maker and became its president in 1899. In 1909 he was elected president and treasurer of the corporation and retained these offices until 1913 when he sold his interests and retired from the company. He acquired an interest in Winter Bros. Co. in 1914, and held the office of treasurer until 1926 when failing health caused him to relinquish it. He retained directorship until 1928 when continued poor health caused him to retire from active business.

WILLIAM H. WILLIAMS, 57, chairman of the board and president of the Wabash Railway Co., died in St. Louis, Oct. 14, after a heart attack. Chairman of the Railroad since 1915, Mr. Williams was elected president Sept. 10 to succeed JAMES E. TAUSSIG, who had resigned the preceding day to devote himself to personal affairs.

FREDERICK C. J. WISS, 73, president and treasurer of J. Wiss & Sons Co., cutlery manufacturer of Newark, N. J., died in East Orange, N. J., Oct. 9, after a year's illness. His father, JACOB WISS, founded the concern more than 80 years ago. When Mr. Wiss, at sixteen, started with his father's firm, it employed three men and the power for the machines came from a treadmill operated by a Newfoundland dog. The firm now employs 500 men.

MEETINGS

STEEL FOUNDERS' SOCIETY OF AMERICA, INC.
New York meeting. Oct. 22. Granville P. Rogers, managing director, 932 Graybar Bldg., New York, N. Y.

AMERICAN IRON & STEEL INSTITUTE
Fortieth General Meeting, Hotel Commodore, New York, N. Y., Oct. 23. Headquarters, 75 West St., New York.

SOCIETY OF AUTOMOTIVE ENGINEERS
National transportation meeting, Washington, D. C., Oct. 27-29. John A. C. Warner, secretary, 29 W. 39th St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION
Industrial marketing conference, Hotel Statler, Cleveland, Ohio, Nov. 11-13 Headquarters, 20 Vesey St., New York.

INTERNATIONAL ACETYLENE ASSOCIATION
Thirty-second Annual Convention, Congress Hotel, Chicago, Nov. 11-13. Headquarters, 30 East 42nd St., New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual meeting, Engineering Societies Bldg., New York, N. Y., Nov. 30-Dec. 5. Calvin W. Rice, secretary, 29 West 39th St., New York, N. Y.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Conn., Bridgeport—Kish Bros., 606 Pine St., awarded contract for the construction of a 1 story, 60 x 100 ft. service garage at Cherry and Pine Sts. Estimated cost $40,000. J. A. Havlieck, c/o owner, Archt.

Conn., East Hampton — Valley Foundry Co., subsidiary of Connecticut Foundry Co., Rocky Hill, plans to rebuild plant destroyed by fire.

Conn., New Haven—Berger Bros., 35 Derby Ave., is having revised plans prepared for a 5 story, 40 x 120 ft. factory for the manufacture of surgical apparatus. Estimated cost $75,000. Douglas Orr, 956 Chapel St., Archt.

Del., Wilmington—Bond Mfg. Corp., 5th and Monroe Sts., plans completed for a 2 story, 60 x 300 ft. addition to plant for the manufacture of bottle caps, collapsible tubing, etc. Estimated cost $60,000. Brown & Whiteside Inc., DuPont Bldg., Archts.

Fla., Jacksonville — Continental Can Co., awarded contract for a 1 story, 48 x 75 ft. addition to plant.

Ill., Chicago—Northern Pacific Railway Co., St. Paul, Minn., plans reconstruction of shops here destroyed by fire. Loss $30,000. B. Blum, St. Paul, Ch. Engr.

Ill., Hoopeston — Sprague-Sells Corp., 308 West Washington St., Chicago, manufacturers of canning and refrigerating machinery, plans addition to plant here. Estimated cost $150,000.

Ind., Auburn—Beacon Oil Co., 1702 North Harrison St., Fort Wayne, will build a service station at Sixth and Jackson Sts. here. Estimated cost $40,000. Private plans. Work will be done by owners.

Ind., Franklin—Gulf Refining Co., awarded contract for service station on West Jefferson St. Estimated cost $40,000.

Ind., Indianapolis—Great Western Oil Co., 1602 Deloss St., awarded contract for the construction of a service station at Fort Benjamin Harrison. Estimated cost $40,000.

Ind., Pendleton — State Prison Board, Indianapolis, plans a 3 story, 80 x 160 ft. trade and vocational school at State Reformatory here.

Me., Bangor—A. E. Webber, c/o Webber Motor Co., 142 Exchange St., is receiving bids for a 1 story, 90 x 175 ft. service station on Hammond St. Estimated cost $40,000. F. A. Patterson, 16 Central St., Archt.

Md., Baltimore—R. H. Bozman & Bros., Inc., 1046-1054 Granby St., manufacturers of refrigerators, display cases, etc. will build additon to plant.

Mass., Bridgewater — Commonwealth of Massachusetts, Dept. of Correction, plans a service building including refrigeration system at State Farm. Estimated cost $40,000. Architect not selected.

Mass., Brockton—Packard Car Agency, D. W. Packard, 540 Warren Ave., is receiving bids for the construction of a 1 story, 100 x 200 ft. garage. Estimated cost $60,000. J. W. Beal Sons, 185 Devonshire St., Boston, archts. Noted Sept. 17.

Mass., Danvers—G. Stahler, 15 High St., Middletown, is having plans prepared for a 1 story, 60x100 ft. service garage, etc. on Maple St. here. Estimated cost $40,000. G. H. Fanning, 221 Essex St., Salem, Archt.

Mass., Dorchester (Boston P. O.) — Massachusetts Automobile Service, 1228 Massachusetts Ave., awarded contract for a 1 story, 60 x 150 ft. automobile repair shop at 1236 Massachusetts Ave. Estimated cost $40,000. Noted Oct. 1.

Mass., East Boston (sta. Boston) — Shell Eastern Petroleum Products Inc., 141 Milk St., Boston, awarded contract for a 1 story service station here.

Mass., Fall River—Firestone Tire & Rubber Co., 1278 South Main St., Akron, O., plans addition to service station at Pleasant and Ayth Sts. Estimated cost $45,000. Private plans.

Mass., Lawrence—F. E. Snow, Bradford St., manufacturers of automobile springs, awarded contract for addition and alterations to plant at Bradford and West Sts. Estimated cost $40,000.

Mass., Mattapan — Hospital Department awarded contract for the construction of a 1 story garage on River St. Estimated cost $40,000.

Mass., Middleboro—Nemasket Transportation Co., West Grove St., is receiving bids for the construction of a 1 story, 65 x 110 ft. garage. Estimated cost $40,000. W. G. Harlow, 18 Pierce St., Archt.

Mass., South Boston (sta. Boston)—Realty Construction Corp., 161 Devonshire St., Boston, is having sketches made for alterations to garage from terminal basement. Estimated cost $40,000. Blackall, Clapp, Whittemore & Clark, 31 West St., Boston, Archts.

Mass., Whitman—United Shank & Findings Co., c/o United Shoe Machinery Corp., 140 Federal St., Boston, awarded contract for addition and alterations to factory. Estimated cost $40,000. Noted Sept. 24.

N. J., Newark—Dept. of Public Affairs, City Hall, awarded contract for a 2 story, 130 x 190 ft. automobile service, repair and garage building. Estimated cost $300,000.

N. J., Woodbridge—Owner c/o E. C. Wierzbicki, 175 Smith St., Perth Amboy, is having preliminary plans prepared for a 2 story addition to factory at Avanal St. and Wolf Pl. Estimated cost $40,000.

N. Y., Brooklyn—Reid Ice Cream Co., 524 Waverly Ave., awarded contract for a 1 story, 95 x 99 ft. service garage at Waverly Ave. and Fulton St. Estimated cost $40,000. Noted Oct. 15.

N. Y., New York—Five Hundred Fourteen West 23rd St. Corp., 100 Southern Blvd., plans a 4 story, 98x122 ft. garage and storage building. Estimated cost to exceed $130,000. R. G. Cory, 30 Church St. Archt.

N. Y., Syracuse—Syracuse Lighting Co., Inc., 421 South Warren St. awarded contract for third unit of service center at Erie Blvd. and Franklin St. $40,000. Noted Sept. 24.

N. C., Kinston — Board of Trustees, Coswell Training School, plans completed for addition to boys' industrial school at Hines Junction. Estimated cost $30,000. Benton & Benton, Wilson, Archts.

O., Cleveland—Di-Nock Mfg. Co., Keith E. Weigle, Pres., 875 East 140th St., manufacturers of decalcomania materials, plans the construction of a factory. Estimated cost $50,000. Architect not selected.

O., Youngstown—Youngstown Sheet & Tube Co., Stambaugh Bldg., plans the construction of an electric weld pipe mill. Estimated cost $1,500,000. Private plans.

Ore., Portland—Northwest Public Service Co., Electric Bldg., awarded contract for additions and improvements to car barns and repair shops. Estimated cost $35,000.

Pa., Erie—H. F. Watson Paper Co., 143 East 16th St., is having plans prepared for a 1 story, 80 x 200 ft. addition to plant for the manufacture of roofing and paper products including storage and distribution building, etc. Estimated cost $45,000.

Pa., Shaler Township—Board of Education, F. C. Kousman, Pres., Glenshaw, preparing plans for a 3 story elementary and high school including manual training departments, etc. at Mount Royal Blvd. Estimated cost $220,000. Ingham & Boyd, Empire Bldg., Pittsburgh.

R. I., Charlestown—State Board of Public Roads, State House, awarded contract for the construction of a garage and tool shop for Dept. of Roads. Estimated cost $40,000.

R. I., Providence—J. J. Finnegan, 134 Sharon St., will build a 1 story service garage at 149 West Park St. Estimated cost $40,000. W. G. Richards, 49 Westminster St., Archt. Work will be done by day labor.

S. C., Lyman—Lyman Mills, Inc., or Pacific Mills, awarded contract for addition to textile mill. Estimated cost $500,000.

Tenn., Nashville—State Board of Education, State Capitol, awarded contract for the construction of a women's vocational building and men's agricultural and industrial building at A. & I. State Normal School. $277,000. Noted Sept. 17.

Tex., College Station—Texas A. & M. College, plans by Dec. 1, and will purchase materials and erect a 2 and 3 story engineering shop under supervision of college superintendent of construction. $200,000. F. E. Giesecke, College Station, Archt., and L. D. Royer, Smith-Young Tower, San Antonio, Engr. Equipment will be purchased later.

Tex., Duncan Field—A. W. Parker, Constructing Quartermaster, Randolph Field, San Antonio, awarded contract for a 450x560 ft. engineering shop, dope house, dope storage warehouse, etc. here. $679,700. Noted Sept. 24.

Tex., Palestine—City Council, plans the construction of a municipal airport to include reconditioning and repair shops, etc.

Wis., Baldwin—American Telephone & Telegraph Co., 311 West Washington St., Chicago, Ill., is having plans prepared for a 1 story, 50x50 ft. repeater station here. Estimated cost $40,000. Private plans.

Wis., Baldwin—Western Cable & Electric Co., G. Hansen, Mgr., plans the construction of a factory. Estimated cost $40,000. Architect not selected.

Wyoming—State Highway Department, Cheyenne, will soon award contract for the construction a 1 story, 30x80 ft. shop building at Laramie and 1 story, 42x124 ft. shop at Kemmerer. Z. E. Sevison, c/o State Highway Dept., Engr.

Ont., Leaside—DeForest-Crosley Radio Co., Ltd., 245 Carlaw Ave., Toronto, plans erection of a plant here.

Equipment Wanted

D. C., Washington—Bureau of Supplies & Accounts, Navy Dept.—will receive bids until Oct. 27 for motor driven grinding machine for Navy Yard, Norfolk, Va., Sched. 6720, Oct. 27 for motor driven high speed duty roughing lathe, for Navy Dept., Philadelphia, Pa., Sched. 6702, Nov. 3 for motor driven disc grinder and motor driven planing and surfacing machine for Navy Yard, San Diego, Calif., Scheds. 6729 and 6,725, Nov. 3, for motor driven hack saw for Navy Yard, New York and San Francisco, Calif., Sched. 6717.

D. C., Washington—District Commissioners will receive bids until Oct. 29 for two lathes and one shaper for public schools.

Mass., East Weymouth—Plymouth Quarries, Inc.—600-1,000 ft. Ingersoll-Rand electrically driven air compressor.

Mass., Boston—Bureau of Yards and Docks, Navy Dept.—will receive bids until Oct. 27 for one melting furnace unit. Sched. 6718.

Mass., South Boston—J. Coffey, 247 L St.—die set for 4 to 8 in. diameter punches.

Pa., Philadelphia—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until Oct. 27, for a motor-driven engine lathe. Sched. 6694.